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A REVIEW OF THE NORTH AMERICAN GENERA OF LAPHYSTIINI,
WITH A REVISION OF THE GENUS *ZABROPS* HULL
(INSECTA: DIPTERA: ASILIDAE)

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ABSTRACT: The anatomical characteristics of the laphystiini genera *Laphystia*, *Psilocurus*, *Perasis*, and *Zabrops* were studied, with emphasis placed on the male and female genitalia. Similarities in the genitalia of the Laphystiini and the Laphriinae provide evidence that these groups should be included together; structural differences in the genitalia were used to distinguish the genera studied. The following species and subspecies of *Zabrops* are recognized: *flavipilis* (Jones), *tagax tagax* (Williston), *tagax argutus* new subspecies, *wilcoxi wilcoxi* new species and subspecies, *wilcoxi playalis* new subspecies, *wilcoxi arroyalis* new subspecies, *thologaster* new species, and *janiceae* new species. Keys and illustrations are provided.

INTRODUCTION

The asilid tribe Laphystiini, nearly world-wide in distribution, is represented by four genera in North America: *Laphystia* Loew, *Psilocurus* Loew, *Perasis* Hermann, and *Zabrops* Hull. Many genera in the tribe are poorly known taxonomically needing redefinition or revision. Concurrently new characters are needed to establish an improved classification of the tribe.

The small genus *Zabrops* is especially in need of such revisionary work. These robber flies are commonly found during the spring and summer in the southwestern and central United States and northwestern Mexico. Although numerous specimens exist in collections, most are unidentified; only four specimens have been recorded in the literature, the last one in 1909. The identity of the two species currently placed in the genus is obscure and several undescribed species are on hand.

The purpose of this study is to provide descriptions of the taxa of *Zabrops* and to evaluate and illustrate new differentiating features of the North American genera of Laphystiini.

MATERIALS

This study is the result of the examination of 1,025 adult specimens of *Zabrops* and approximately 150 specimens of 60 species in 10 other genera of Laphystiini.

The following abbreviations indicate the museums and private collections from which specimens were borrowed or examined: ASU—Arizona State University, Tempe, Arizona (M. Cazier); CAS—California Academy of Sciences, San Francisco, California (P. H. Arnaud, Jr.); CDA—Bureau of Entomology, California Department of Agriculture, Sacramento, California; CIS—California Insect Survey, University of California, Berkeley, California (E. I. Schlinger, J. Powell); CM—C.

H. Martin, Tucson, Arizona; CSLB—California State University, Long Beach (E. L. Sleeper); EF—E. M. Fisher, Long Beach, California; FSCA—Florida State Collection of Arthropods, Gainesville, Florida (H. V. Weems, Jr.); JW—J. Wilcox, Anaheim, California; LACM—Natural History Museum of Los Angeles County, Los Angeles, California (C. L. Hogue, R. R. Snelling); OSU—Ohio State University, Columbus, Ohio (C. A. Triplehorn); UCD—University of California, Davis, California (R. O. Schuster); UCR—University of California, Riverside, California (S. Frommer, J. D. Pinto); UK—Snow Entomological Museum, University of Kansas, Lawrence, Kansas (G. W. Byers); USNM—Smithsonian Institution, Washington, D.C. (L. V. Knutson).

METHODS

DISSECTIONS.—Male and female genitalia were examined in from one to several representatives of each population, depending on the number of specimens available. These techniques were used: (1) specimens to be dissected were placed in a relaxing chamber for periods of four to six hours in order to partially soften the tissues; (2) the apical half of the abdomen was cut off and placed in 10 percent KOH, heated to near boiling, for about 30 minutes; (3) the treated parts were washed in distilled water and excess tissue was removed; (4) the parts were then transferred to a watchglass with glycerine and dissected as necessary; (5) in males the hypopygium was removed from the abdomen, the epandrium separated from the gonopods, and the aedeagus removed; (6) for illustrative purposes, in some males the tergites and sternites 7 and 8, the dististyli, and the lateral processes were removed as well; (7) in females the tergite and sternite 8 were separated from the remnants of the abdomen; (8) after study, the parts were stored in glycerine in polyethylene microvials with silicone stoppers and the vials were placed on the pin with the specimen.

ILLUSTRATIONS.—All drawings were made with the aid of a camera lucida attached to a stereomicroscope.

Genitalia to be illustrated were placed in a depression slide on a minute spot of "Gelva" polyvinyl alcohol (pva), quickly positioned, then covered with glycerine and a cover glass. The pva prevented the structures from drifting while

being drawn and had the added advantage of being easily dissolved with alcohol.

The gonopods were slightly elevated anteriorly when drawn in order to place the median process and the hypandrium in a horizontal plane. All bristles and hairs were omitted from the drawings.

MEASUREMENTS.—All measurements were made with an ocular micrometer as follows: (1) width of face—measured immediately below the antennae; (2) width of eye—measured on same plane as face; both eyes were measured and an average taken; (3) length of body—measured from the anterior edge of the face to the tip of tergite 6; if the abdomen was curved (the usual case) the measurements were made on more than one plane for greater accuracy; (4) length of wing—taken from the base at the thorax to the tip; (5) width of tergite 3—measured from the dorsal view (can be interpreted as the width of the abdomen). Measurements 1 and 2 were made at 50× and measurements 3 to 5 at 12×.

The means and standard errors of the above measurements, plus the ratios of eye/face widths and body/wing lengths, are listed in Table 1 for seven of the eight taxa of *Zabrops*. For *Z. flavipilis* (Jones), with only two specimens available, these measurements are given with the description.

TERMINOLOGY.—In the descriptions of taxa, I have used terms as defined in Torre-Bueno (1962), with several exceptions.

I have followed Karl (1959) for the terminology of nearly all the structures of the male genitalia and Martin (1968) for certain parts of the aedeagus. Crampton (1942) and Artigas (1971) were the sources of terms used for the female genitalia.

The names of the lateral sclerites of the thorax are after Bonhag (1949), with a few differences. In the generic descriptions I used ANTERIOR BAND and POSTERIOR SPOT for areas on the pleural region that are usually bare of tomentum. The anterior band is a vertical area that extends from about the middle of the mesoanepisternum, down across the mesokatepisternum, to the base of the coxae. The posterior spot occupies most of the anterior three-fourths of the meron, just above and behind the middle coxae.

PILE is used loosely and refers to any type of "softer" hair. TOMENTUM is the micro-pubescence of the integument and is used in-

TABLE 1. MEANS AND STANDARD ERRORS (IN MM) OF SELECTED MEASUREMENTS AND RATIOS OF *Zabrops* SPECIES AND SUBSPECIES.

Species & subspecies of <i>Zabrops</i> and locality		Eye width	Face width	Body length	Wing length	Tergite 3 width	Eye width/ face width	Body length/ wing length
<i>Z. tagax</i> (Yermo)	♂♂ (N = 25)	0.90 ± .01	0.69 ± .01	9.94 ± .12	6.42 ± .06	1.90 ± .03	1.31 ± .01	1.54 ± .01
	♀♀ (N = 25)	0.89 ± .01	0.71 ± .01	9.54 ± .09	6.61 ± .07	2.27 ± .04	1.26 ± .01	1.44 ± .01
<i>Z. tagax argutus</i> (El Rosario)	♂♂ (N = 12)	0.92 ± .01	0.72 ± .01	9.98 ± .14	6.34 ± .08	1.95 ± .04	1.28 ± .01	1.57 ± .01
	♀♀ (N = 6)	0.91 ± .01	0.76 ± .01	9.63 ± .16	6.70 ± .13	2.33 ± .05	1.19 ± .02	1.44 ± .01
<i>Z. w. wilcoxi</i> (Mt. Diablo)	♂♂ (N = 17)	0.86 ± .01	0.73 ± .01	9.38 ± .14	5.96 ± .09	2.11 ± .05	1.17 ± .01	1.57 ± .02
	♀♀ (N = 10)	0.86 ± .01	0.76 ± .01	9.19 ± .12	6.30 ± .04	2.35 ± .03	1.13 ± .01	1.46 ± .01
<i>Z. w. playalis</i> (Pismo Beach)	♂♂ (N = 25)	0.91 ± .01	0.70 ± .01	9.06 ± .10	5.93 ± .06	2.09 ± .04	1.29 ± .01	1.53 ± .01
	♀♀ (N = 25)	0.93 ± .01	0.76 ± .01	9.24 ± .10	6.30 ± .06	2.39 ± .04	1.23 ± .01	1.47 ± .01
<i>Z. w. arroyalis</i> (Simmler)	♂♂ (N = 17)	0.89 ± .01	0.71 ± .01	9.97 ± .12	6.15 ± .05	1.83 ± .03	1.24 ± .01	1.62 ± .01
	♀♀ (N = 13)	0.92 ± .01	0.76 ± .02	10.19 ± .19	6.86 ± .12	2.48 ± .05	1.21 ± .02	1.49 ± .01
<i>Z. thologaster</i> (Bahía San Quintín)	♂♂ (N = 25)	0.75 ± .01	0.61 ± .01	7.69 ± .09	5.30 ± .06	1.64 ± .03	1.23 ± .01	1.45 ± .01
	♀♀ (N = 10)	0.75 ± .01	0.63 ± .01	7.46 ± .21	5.54 ± .11	2.00 ± .06	1.19 ± .02	1.35 ± .02
<i>Z. janiceae</i> (Bahía Los Angeles)	♂♂ (N = 10)	0.89 ± .01	0.67 ± .01	9.06 ± .10	5.99 ± .07	1.95 ± .04	1.33 ± .01	1.51 ± .01
	♀♀ (N = 18)	0.87 ± .01	0.69 ± .01	8.84 ± .12	6.40 ± .08	2.36 ± .04	1.26 ± .01	1.38 ± .01

stead of "pollen." The latter term implies a dust-like or granular nature for this vestiture, which is not the case. Under very high magnification, tomentum is seen to consist of minute, recumbent, curved hairs or setae. In discussing the condition of pile on the mesonotum, I use "anteriorly" to mean the entire anterior half of the disc, between the transverse suture and the anterior margin.

CRITERIA USED FOR SPECIES AND SUBSPECIES.—All of the taxa that I have recognized in the genus *Zabrops* are allopatric—based on present knowledge of their distribution. This situation has led to some difficulty in defining them by the biological species concept, where reproductive isolation (most easily discerned in sympatric populations) is the main criterion (Mayr 1963).

Therefore, it has been necessary to infer speciation (reproductive isolation) by differences in the phenotype of populations or groups of populations. I have done this in the following manner: species have fundamental differences in the structure of the male genitalia, a usually greater overall differentiation of characters, and the absence of any intermediate character states; subspecies have no fundamental differences in the male genitalia, usually less overall character differentiation, usually have intergradation of characters, and are geographically delimited. I believe subspecies are of taxonomic value in *Zabrops* because they depict distinctive populations which are phenotypically and geographically concordant.

Variant populations not fitting the above criteria for a subspecies are discussed under their respective taxa.

ACKNOWLEDGMENTS

I am grateful for assistance from many people. Most especially, I thank Mr. Joseph Wilcox for the great amount of help, encouragement, and advice that he has given me on this project and on my study of robber flies in general. Indeed, most of the *Zabrops* specimens used in this study were loaned to me by Mr. Wilcox, who had either collected the material himself or had borrowed it from various museums.

Mr. R. L. Westcott, Drs. R. C. Penrose, E. L. Sleeper, G. Mansfield-Jones, W. D. Stockton, and R. B. Loomis have all kindly reviewed this paper and offered many helpful suggestions.

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I owe much gratitude to the people listed in the materials section for the loan of specimens used in this study, but I especially thank Dr. George W. Byers for sending me the holotype of *Zabrops tagax* to examine.

Finally, I give very special thanks to my wife Janice for her help in many aspects of this study.

TAXONOMIC SECTION

Tribe LAPHYSTIINI

CHARACTERISTICS AND RELATIONSHIPS.—The tribe Laphystiini consists of about 25 described genera and is found in all the faunal regions, but the Ethiopian, southern Palearctic, and Neotropical are best represented. One genus each occurs in the Oriental and Australian regions, while four genera are found in the Nearctic (Hull 1962).

The taxonomic position of the Laphystiini has been somewhat controversial, various authors placing them in the subfamily Dasypogoninae, the subfamily Laphriinae, or in the Dasypogoninae with the Laphriinae also included. Wilcox (1960) and Oldroyd (1963) reviewed the taxonomic history of the Laphystiini, Oldroyd concluding that the tribe belonged in the Laphriinae. Oldroyd (1970) subsequently included the genera of Laphystiini in the tribe Laphriini.

I believe that the Laphystiini is indeed closely related to the Laphriini and should be placed in the same subfamily with that group but with separate tribal status. The primary evidence for this close relationship is the great similarity in structure between male and female genitalia of both these groups. Karl (1959), in a comprehensive study of the male genitalia of Asilidae, was the first to mention this similarity. He compared the male genitalia of *Hoplistomerus nobilis* Loew, a laphystiin from Africa, with those of three genera and nine species of Laphriini and concluded: "The single principal difference consists only in that *Hoplistomerus* has still no hypopygial inversion" (translated). Even this difference can be eliminated because Karl was in error in believing that the hypopygium of *Hop-*

listomerus is not inverted. I have examined six male specimens of *H. nobilis* and one male each of *H. engelii* Oldroyd and *H. zelimina* Speiser; in all specimens the genitalia was rotated 180°. Apparently the single specimen of *H. nobilis* that Karl studied was collected before rotation (inversion) had occurred.

The general structure of the laphystiini hypopygium is as follows (partly from Karl 1959): (1) the hypandrium is reduced or absent (in which case it is possibly "absorbed" in the coalescing of the basistyli); (2) the gonopods have large basistyli, fused medially; (3) the basistyli uniformly have two pairs of appendages, the dististyli and the lateral processes—these structures assume a wide variety of shapes within the tribe and are important as taxonomic characters; (4) the epandrium is coalesced into a single, cupped, shield-like structure; (5) the ventral lamellae are well developed and are longer than the cerci; (6) the aedeagus has three tubes, one dorsal and two ventral, which are partially to entirely coalesced; (7) the hypopygium is rotated from 90° to 180° around the longitudinal axis of the abdomen.

The Laphystiini are further characterized by a great size reduction of abdominal segments 7 and 8. In males of this tribe only tergites 1 to 6 are visible from above; the remaining tergites 7 and 8 are hidden beneath the much larger tergite 6. Tergite 8 is reduced to a fraction of the length of tergite 6, while tergite 7 is not quite so reduced in length; sternite 8 is reduced in width, assuming a rounded or rhomboid shape; sternite 7 is either entirely absent or is represented as a minute vestigial sclerite. Karl (1959) attributes this size reduction to the rotation of the hypopygium, segments 7 and 8 being partly rotated also, with segment 8 affected the most. This reduction is evident in other asilids with inverted genitalia (e.g., other Laphriinae and certain genera of Dasygogoninae) but is greatest in this tribe.

In the female genitalia, sternite 8 generally has a subapical depression and from one to three apical notches. Acanthophorites are absent, but frequently there are strong bristles apically on tergites 8 or 9, or on sternite 8. The spermatheca consists of three long filamentous tubes, the distal half of each loosely coiled. The tubes empty into the bursa which is supported by a lightly sclerotized, U-shaped furca. The spermathecae are remarkably uniform in appearance in the

Laphystiini, at least among the North American genera.

In the wings of the Laphystiini, the marginal cell is open to narrowly closed; when closed, the second vein (R_{2+3}) is usually recurrent. The first posterior cell is open to closed and petiolate; the fourth posterior and anal cells are closed and usually petiolate. In many genera the costa is reduced (in width and/or length) or absent beyond the apex of the wing. The other groups of Laphriinae have a similar venation but the marginal cell is always closed and long-petiolate and the second vein is never recurrent.

The head is relatively broad, averaging about one and one-half to one and three-fourths times wide as high. The antennae are always provided with an apical pit enclosing a small spine. Usually this pit is preceded by a one- or two-segmented microsegment (the style); at least one genus, *Psilocurus*, lacks the style. The palpi are two-segmented.

In the Laphystiini, the prosternum is complete, fused with the pronotum laterally, as in the majority of asilids. A mesopleural bristle is sometimes present (e.g., in some species of *Hoplistomerus*, *Trichardis* and *Martinia*, at least) but usually is absent; the presence of this bristle has been used to characterize the Laphriinae in the past. The postscutellar slopes (mediotergite) are micropubescent—never with hair or bristles as in some other Laphriinae. The postmetacoxal area is membranous.

In some genera of laphystiins, the hind femora is strongly swollen and with ventral, setiferous tubercles. The anterior and middle tibiae are without any modified bristles or spines. The pulvilli are occasionally abbreviated, or even absent, in certain genera.

The adults are characteristic inhabitants of open areas where they are found resting either directly on the ground or on pebbles or decumbent herbaceous vegetation very close to the ground. Laphystiini are commonly encountered in such habitats as alkaline flats, sand dunes, sea beaches, muddy or dry margins of streams, arroyos, fields, roadsides, and paths in more forested areas. Little is known about the biology of the immature stages of laphystiins. Krivosheina (1973:459) found that larvae and pupae of the Palearctic species *Laphystia carnea* Hermann "develop in sandy loam soils, usually by edges of depressions, in regions with tamarisk and various annual saltworts." It

seems likely that the other genera of this tribe are also soil dwelling because the adults are often found in locales where suitable wood is scarce. The other groups of Laphriinae are predominately forest inhabiting, with adults which mainly sit on leaves, branches, or logs; as far as is known, their larvae live in decaying wood where they are predaceous on the immature forms of wood-burrowing Coleoptera and Hymenoptera (Hull 1962; Knutson 1972).

Many of the aforementioned attributes are not individually exclusive to the Laphystiini. However, when taken as a whole, they serve to characterize the group well. Also, the ecological differentiation between this tribe and the remainder of the Laphriinae, together with the anatomical differences in the male abdomen and the wing venation, justify keeping the Laphystiini as a separate tribe.

THE NORTH AMERICAN GENERA OF LAPHYSTIINI.—Two keys, published recently, serve to separate the four genera of North American Laphystiini: Wilcox (1960), for the United States, and Hull (1962), for the world. However, with the discovery of additional species and variation in *Zabrops*, along with a wider variation of characters in other genera, a revised key is desirable. Such a key is presented below, followed by diagnostic descriptions of the genera.

A fifth North American genus, *Bohartia* Hull, was included by Hull (1962) in the Laphystiini but was subsequently transferred to the Dioctriini by Martin and Wilcox (1965). These characteristics indicate that *Bohartia* is correctly placed in the Dioctriini: wing venation with all cells open; prosternum reduced—isolated laterally from the pronotum; males with gonopods divided and with abdominal segments 7 and 8 not reduced, visible from above.

KEY TO GENERA OF NORTH AMERICAN LAPHYSTIINI

- 1a. Face gibbose on lower 70 percent or less, narrower than eye 2
- 1b. Face entirely gibbose, equal to 1.2 times width of eye; (first posterior cell usually open; hypandrium absent; abdominal tergites 1 to 6 with lateral bristles) *Laphystia* Loew
- 2a. First posterior cell closed; face wide, 60 to 90 percent width of eye; antennal style present; hypandrium present 3
- 2b. First posterior cell widely open; face narrower, 50 to 60 percent width of eye; antennal style absent; hypandrium absent; (abdominal tergites 1 to 6 with lateral bristles.) *Psilocurus* Loew

- 3a. Face most prominent at oral margin, gradually receding above; mystax with a row of strong bristles on oral margin and dense, recumbent, squamose hairs above; lateral bristles present on abdominal tergite 1 only; pronotum with strong dorsal and posterolateral bristles *Perasis* Hermann
- 3b. Face evenly gibbose on more than lower half; mystax consisting of long, slender bristles over entire gibbosity; abdominal tergites 1 and 2 up to 1 through 5 with lateral bristles; pronotum with pile only *Zabrops* Hull

Genus *Laphystia* Loew

Laphystia Loew, 1847: 538. [Type-species: *sabulicola* Loew (monotypy).]

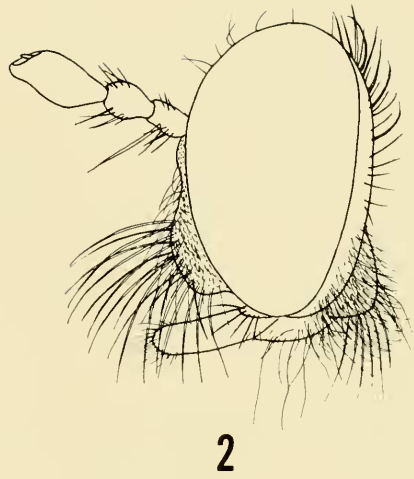
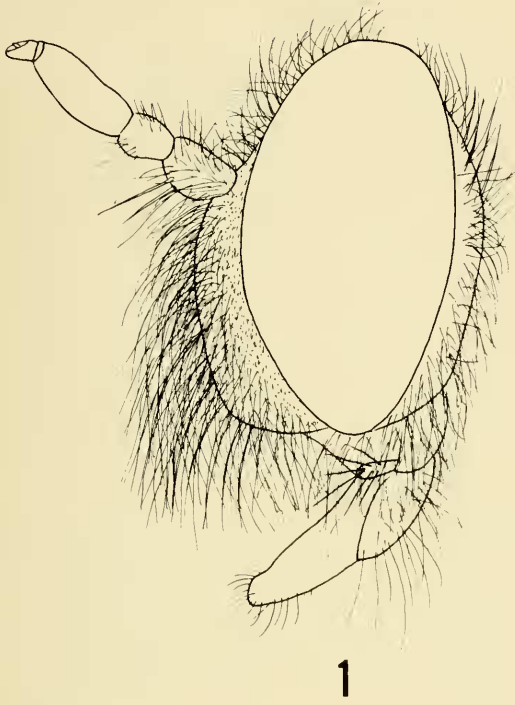
DESCRIPTION.—Small to medium sized flies with short pile and robust form; length 7 to 13 mm.

Head (Fig. 1): face wide, at antennae subequal to one and one-fourth times width of eye, slightly wider at front, evenly produced from oral margin to antennae; gibbosity covered with pile, longest and densest at oral margin where there usually are some slender bristles. Front, vertex, and ocellar tubercule with abundant pile; occiput with both slender bristles and pile; beard thick and rather long. Proboscis short, somewhat robust; palpi small, second segment with a few fine hairs.

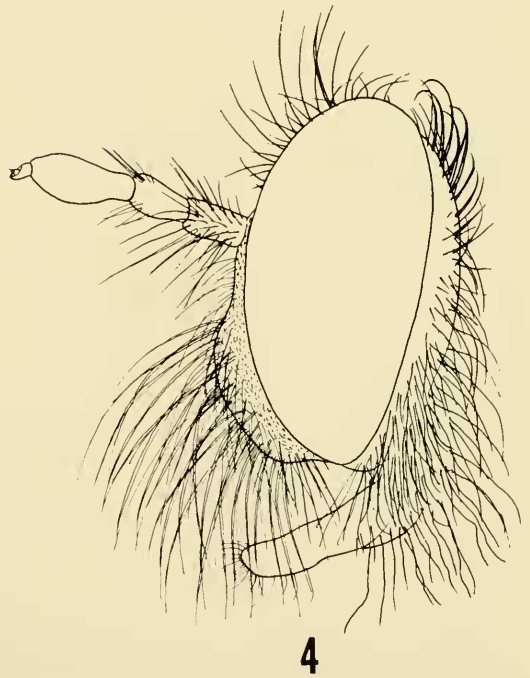
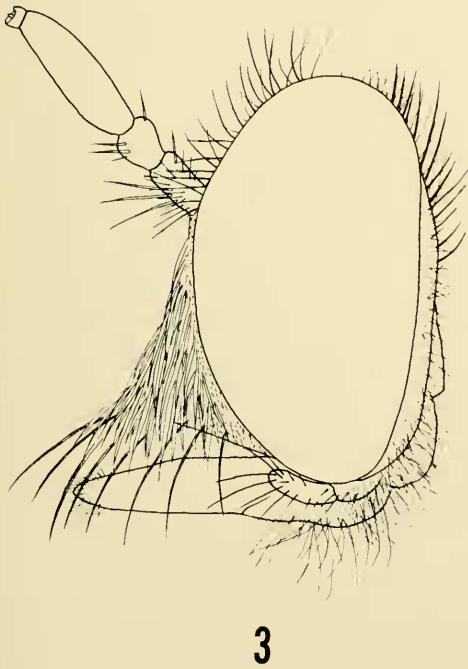
Antennae with segment 1 subequal to one and one-half times as long as segment 2, segment 3 subequal to one and one-third length of segments 1 and 2 together; segment 3 slightly swollen toward middle; sensory area variable, occupying apical one third to two thirds of inner side; style two segmented, the apical segment much longer than the basal and with an oblique excavation bearing a small spine; segment 1 with two strong ventral bristles and numerous hairs only.

Thorax: pronotum with hairs only; mesonotum evenly covered with pile, which varies from short and recumbent to longer and erect; dorsocentral bristles absent; two to three notopleural, supraalar, and postalar bristles present. Scutellum with marginal hairs or bristles, length and number variable. Pleura evenly tomentose, without polished areas; laterotergites with numerous long, slender bristles.

Legs: femora with diameter slightly greater than that of tibiae, and with numerous hairs and several dorsoapical bristles; tibiae and tarsi with bristles longer and more abundant; pulvilli vary-



2.0 mm



FIGURES 1 to 4. Heads of Laphystiini, lateral view. Fig. 1. *Laphystia jamesi*. Fig. 2. *Psilocurus* sp. Fig. 3. *Perasis argentifacies*. Fig. 4. *Zabrops tagax tagax*.

ing from well developed to abbreviated to nearly absent.

Wings: marginal cell narrowly closed to narrowly open; first posterior cell generally open, but closed and petiolate in several species; fourth posterior and anal cells closed petiolate; costa extending to apex of anal cell, absent beyond or, rarely, ending at apex of wing.

Abdomen (Figs. 10 to 12): pile very short and recumbent dorsally, longer and erect laterally and ventrally in some species; tergites 1 to 6 with two or more strong lateral bristles. Males with visible portion of tergite 6 about as long as tergite 5; tergite 7 with middle three-fourths reduced in length; tergite 8 greatly reduced in length save for a posteromedian lobe; sternite 7 absent.

Genitalia, male (Figs. 5 to 9): hypandrium absent. Gonopods with basistyli semi-membranous along midline (incompletely fused?); dististyli simple, like an elongate lobe; lateral processes narrow, with apex semiacute and slightly recurved. Aedeagus with basal part and ejaculatory apodeme moderate sized; tubes coalesced and quite thin apically, curving dorsad. Epandrium wider than long, ventral lamellae and cerci slightly emarginate apically. Hypopygium without prominent bristles.

Genitalia, female (Fig. 13): sternite 8 with apex with three notches, the median most pronounced, forming four lobes; tergite 8 with several to numerous slender, apical bristles. Furca of spermatheca either split or entire basally.

REMARKS.—The genus *Laphystia* contains about 55 described species, the majority from the Northern Hemisphere; these are about equally divided between the Old World and the New World. Probably most, if not all, of the species described from south of the equator as *Laphystia* belong in other genera.

Wilcox (1960) has revised the North American species of *Laphystia*.

Genus *Psilocurus* Loew

Psilocurus Loew, 1874: 373. [Type-species: *nudiusculus* Loew (monotypy).]

Orthonuromyia Williston, 1893: 67. [Type-species: *modesta* Williston (monotypy).]

DESCRIPTION.—Small sized, slender flies with reduced pile; 6 to 13 mm long.

Head (Fig. 2): face narrow, at antennae about 50 to 60 percent as wide as eye, noticeably wider at frons; lower 45 to 65 percent gibbous and covered with strong bristles, remainder plane and with short hairs; sometimes a small swelling is present immediately below antennae. Front and vertex with a few scattered short hairs, ocellar tubercule bare. Occiput with a row of strong bristles; beard short pilose. Proboscis a little longer than face; palpi moderate sized, segment 2 spindle-shaped and with several long slender bristles.

Antennae: segment 1 slightly longer than segment 2, together subequal to segment 3; segment 3 generally strongly swollen at middle, tapering towards ends; sensory area occupying apical one half or less; style absent, apex of segment 3 with a broad oblique concavity bearing a small spine; segment 1 ventrally with a strong bristle and scattered bristly hairs, segment 2 with only bristly hairs.

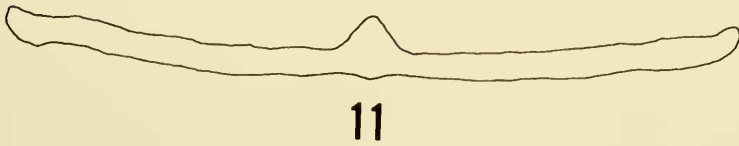
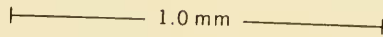
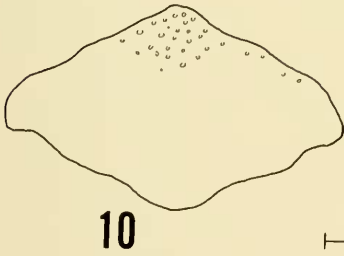
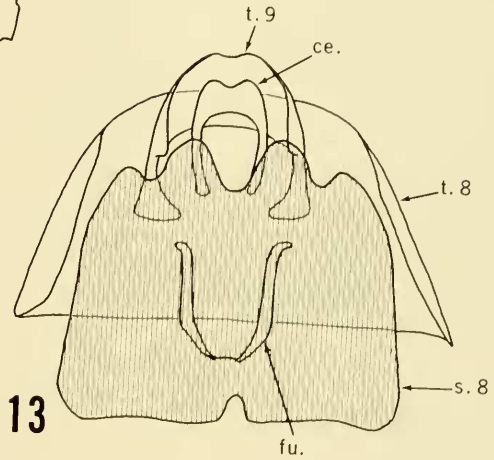
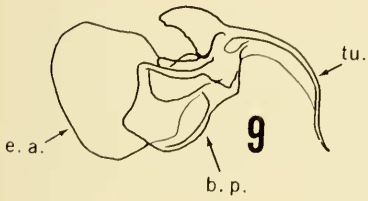
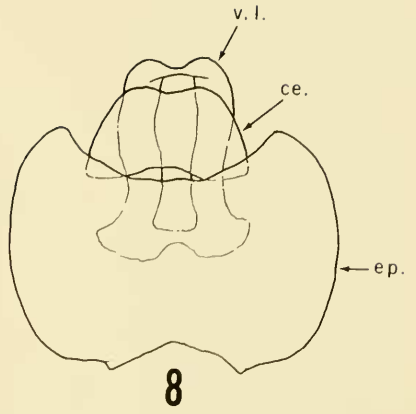
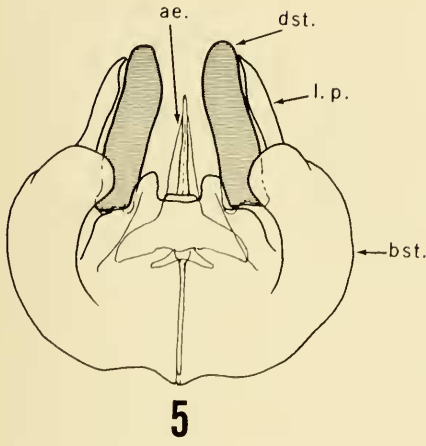
Thorax: pronotum with a double row of fine bristles, laterally with pile. Mesonotum with dense, very short, recumbent setate pile; dorso-central bristles greatly reduced or absent; one notopleural, one supraalar and one postalar bristle—all strong. Scutellum with two to four strong marginal bristles. Pleura with bands and spots subshining to polished; laterotergite with five to seven slender bristles and some shorter hairs.

Legs: femora somewhat swollen, about half again as wide as tibiae, with one to three subapical dorsal bristles; tibiae and tarsi with bristles more numerous apically; pulvilli well developed.

Wings: marginal and first posterior cells wide open; fourth posterior and anal cells closed and short petiolate; costa well developed, complete.

Abdomen (Figs. 19 to 21): pile reduced as on mesonotum. Tergite 1 with two to five strong bristles laterally; tergites 2 to 6 each with one to

FIGURES 5 TO 13. Terminal abdominal segments and genitalia of *Laphystia* spp. (Figs. 5 to 12 *Laphystia jamesi* males, Fig. 13 *Laphystia litoralis* Curran female.) Fig. 5. Gonopods and aedeagus, ventral view, dististyli horizontally lined: ae.-aedeagus; dist.-dististylus; l.p.-lateral process; bst.-basistylus. Fig. 6. Dististylus, lateral view, dorsal surface on left. Fig. 7. Lateral process, lateral view, dorsal surface on left. Fig. 8. Epandrium, dorsal view: v.l.-ventral lamellae; ce.-cerci; ep.-epandrium. Fig. 9. Aedeagus, lateral view, ventral surface above: e.a.-ejaculatory apodeme; b.p.-basal part; tu.-tubes. Fig. 10. Sternite 8, ventral view. Fig. 11. Tergite 8, dorsal view. Fig. 12. Tergite 7, dorsal view. Fig. 13. Ventral view, sternite 8 vertically lined: t.9-tergite 9; ce.-cerci; t.8-tergite 8; s.8-sternite 8; fu.-furca of spermatheca.



two strong bristles laterally. Males with visible portion of tergite 6 longer than tergite 5; tergite 7 with a posteromedian T-shaped projection; tergite 8 quite short, trilobed posteriorly; sternite 7 absent.

Genitalia, male (Figs. 14 to 18): hypandrium absent. Gonopods with dististyli bearing a wide, apically rounded dorsal lobe and a posteriorly directed, ventral, finger-like projection; lateral processes long and tapered, projecting beyond apex of genitalia in most species. Aedeagus with basal part well developed and "box-like"; tubes trifurcate distally, with one dorsal and two ventral parts; ejaculatory apodeme small, produced ventrad. Epandrium about as wide as long; ventral lamellae well developed, produced into two apically tapering, strongly sclerotized lobes; cerci short, with median notch. Epandrium with a few posterolateral bristles.

Genitalia, female (Fig. 22): sternite 8 rounded apically, with shallow median notch; central part excavated. Tergite 8 with several apical bristles. Spermatheca with furca divided basally.

REMARKS.—Nine species of *Psilocurus* have been described from the United States, Mexico, and Ecuador (Hull 1962), and two species are known from western Asia (Lehr 1969). Numerous species remain undescribed, especially from Mexico and Central America.

Genus *Perasis* Hermann

Perasis Hermann, 1905: 37. [Type-species: *sareptana* Hermann (monotypy).]

Triclis, of authors, not of Loew.

Saucropogon Hull, 1962: 103. [Type-species: *Perasis transvaalensis* Ricardo (original designation).]

DESCRIPTION.—Small to medium sized, stout-bodied, black flies with greatly reduced pile; length 8 to 13 mm.

Head (Fig. 3): face about two-thirds to subequal width of eye, slightly wider at frons, produced at oral margin and gradually receding to about middle, upper one-half plane; oral margin with row of about 10 to 15 strong bristles; lower two-thirds of face densely covered with appressed, squamose bristles, upper one-third with

short, erect pile. Front with many slender bristles laterally. Vertex with scattered hairs, ocellar tubercle with about 12 slender bristles. Occiput with 25 to 30 strong bristles; beard sparse and short. Proboscis well developed, twice as long as face; palpi relatively large, segment 2 with many bristles.

Antennae: segment 1 one and one-half times as long as segment 2; segment 3 nearly one and one-half times as long as segments 1 and 2 together, not or slightly swollen; sensory area large, occupying apical two-thirds of inner side of segment 3; style with one segment, about one-fourth as long and one-half as wide as segment 2, broadly excavated apically and bearing a central spine; segments 1 and 2 each with several slender bristles.

Thorax: pronotum with about 20 bristles dorsally and 2 to 4 bristles laterally, all strong and spiniform. Mesonotum evenly covered with extremely short, recumbent pile, mostly spinelike; dorsocentral bristles absent; one notopleural, two to three supraalar, and two to three postalar bristles, all very strong. Scutellum with recumbent marginal hairs only. Pleura with anterior band and posterior spot bare of tomentum; laterotergite with six to eight strong bristles.

Legs: femora not swollen, slightly wider than tibiae; bristles of legs stout but reduced in length and number. Pulvilli well developed.

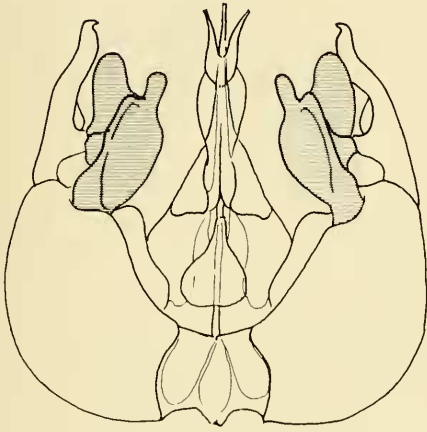
Wings: marginal cell open; first posterior, fourth posterior, and anal cells all closed and short petiolate; costa complete but greatly reduced in thickness beyond apex of wing.

Abdomen (Figs. 28 to 31): pile reduced as on mesonotum. Tergite 1 with four to six strong bristles laterally; remaining tergites without bristles. Males with sternite 7 present; tergites 7 and 8 with middle one-third reduced in length.

Genitalia, male (Figs. 23 to 27): hypandrium present, triangular, partially fused to basistyli. Gonopods with dististyli angulate in middle, the apex recurved; lateral processes slightly curved, tapering to apex. Aedeagus with basal part well developed and with a pair of secondary processes which extend posteriorly, paralleling

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FIGURES 14 TO 22. Terminal abdominal segments and genitalia of *Psilocurus* sp. (Figs. 14 to 21 males, Fig. 22 female). Fig. 14. Gonopods and aedeagus, ventral view, dististyli horizontally lined. Fig. 15. Dististylus, lateral view, dorsal surface on left. Fig. 16. Lateral process, lateral view, dorsal surface on left. Fig. 17. Aedeagus, lateral view, ventral surface above. Fig. 18. Epandrium, dorsal view. Fig. 19. Sternite 8, ventral view. Fig. 20. Tergite 8, dorsal view. Fig. 21. Tergite 7, dorsal view. Fig. 22. Genitalia, ventral view, sternite 8 horizontally lined.



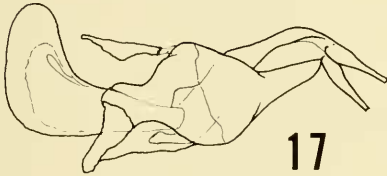
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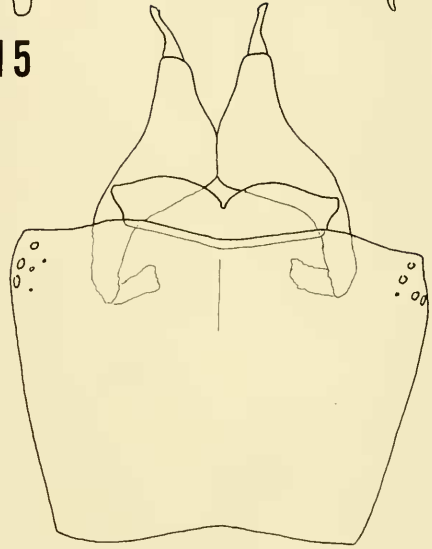
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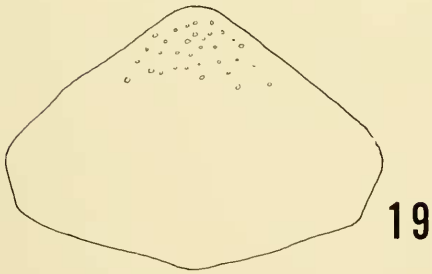
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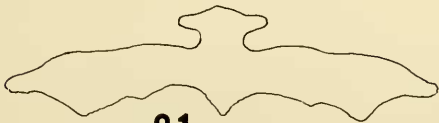


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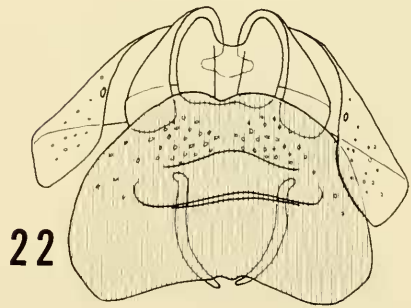
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20



21



22

tubes; tubes relatively wide, coalesced distally; ejaculatory apodeme large. Epandrium about as wide as long; ventral lamellae with apex entire; cerci deeply emarginate apically. Gonopods with numerous posterolateral bristles.

Genitalia, female (Fig. 32): apex of sternite 8 with lateral notches large; median notch smaller, lobes approximate; area anterior to median lobes with pronounced concavity. Tergite 8 without bristles. Furca of spermatheca with base large.

REMARKS.—*Perasis* Hermann is a primarily Old World genus with currently one New World species, *argentifacies* (Williston), from south-central Mexico. Originally described by Williston as a *Triclis*, *argentifacies* was provisionally placed in *Perasis* by Wilcox in 1960; Martin and Wilcox (1965) and Martin and Papavero (1970) have maintained this treatment. As pointed out by Oldroyd (1970), Hull (1962) confused the identity of *Perasis* by presenting a description of that genus based on material misidentified as the type-species (*sareptana* Hermann) and possibly belonging to another genus. Furthermore, he erected a new genus *Saucropogon* (Hull 1962) as a result of his misinterpretation. *Saucropogon* is the same as *Perasis* (*sensu* Hermann) and was synonymized with that genus by Oldroyd (1970).

Based on Hull's thorough description of *Saucropogon* (i.e., *Perasis*), I believe that Wilcox was correct in his placement of *argentifacies*. This species agrees in every detail with Hull's description and some of the characters, namely the structure of the mystax, face, and lateral pronotal bristles, seem to be diagnostic for the genus among the Laphystiini. Comparison of the male genitalia of both Old World and New World species would offer conclusive evidence; unfortunately I have not had the opportunity to examine Old World material.

In addition to *argentifacies*, several undescribed species of *Perasis* exist in Mexico and the United States.

Among the North American Laphystiini, *Perasis* is most similar to *Zabrops*. These genera

share several characteristics: same wing venation; possession of hypandrium and sternite 7 in males; similar type dististyli and female sternite 8. Despite these similarities, many differences in other character states (cited in descriptions) indicate that these two genera are not especially closely related.

Genus *Zabrops* Hull

Zabrops Hull, 1957: 90. [Type-species: *Triclis tagax* Williston (original designation).]

Triclis, of authors, not of Loew.

DESCRIPTION.—Small to medium sized flies with short pile, 6 to 11 mm long.

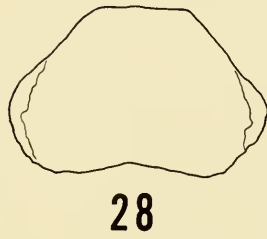
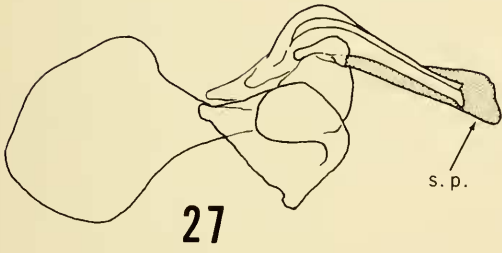
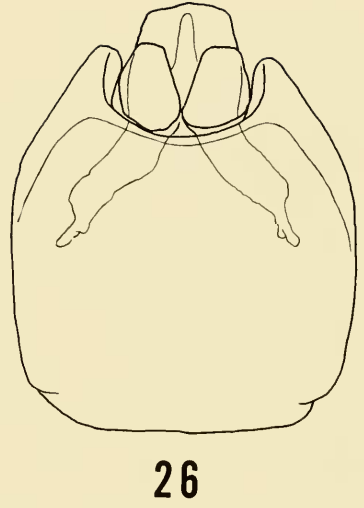
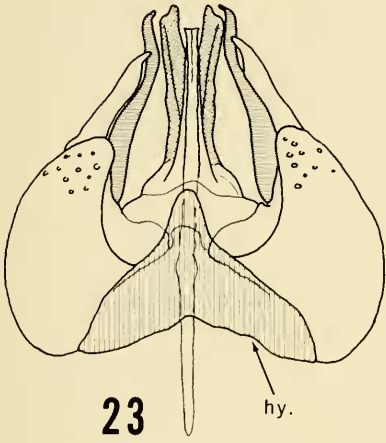
Head (Fig. 4): face at antennae 60 to 90 percent width of eye, slightly wider below and at front; lower 55 to 70 percent gibbose and covered with slender bristles subequal in length to antennae; plane part with short hairs. Front with hairs and slender bristles laterally. Vertex with numerous hairs, ocellar tubercule with two or four bristles. Occiput with about 20 bristles, usually strong; beard moderately dense and long. Proboscis subequal to length of face; palpi small, segment 2 with several long hairs.

Antennae: segment 1 subequal to one and one-half times as long as segment 2; segment 3 subequal to three-fourths as long as segments 1 and 2 together, slightly to strongly swollen just beyond middle; sensory area small, restricted to apical one-third of inner side; style one or two segmented, about one-third as long and wide as antennal segment 2, apex obliquely concave and with minute spine; segments 1 and 2 with numerous hairs, segment 1 with one to several strong bristles ventrally.

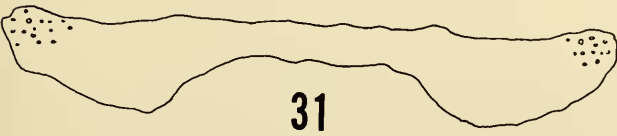
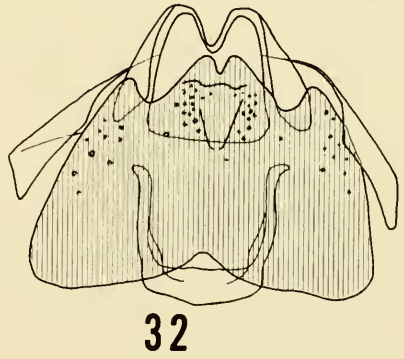
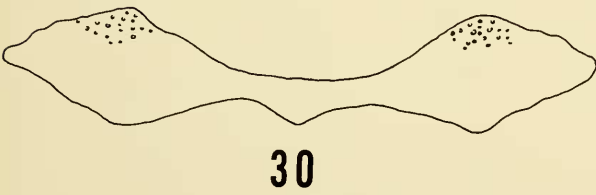
Thorax: pronotum with hairs only. Mesonotum with pile sparse and recumbent to dense and erect; dorsocentral bristles hairlike, not or weakly differentiated from other dorsal pile; two to four notopleural, supraalar, and postalar bristles. Scutellum with 10 to 20 long marginal bristles. Pleura with anterior band and pos-

→

FIGURES 23 to 32. Terminal abdominal segments and genitalia of *Perasis argentifacies* (Figs. 23 to 31 males, Fig. 32 female). Fig. 23. Gonopods, hypandrium, and aedeagus, ventral view, dististyli horizontally lined, secondary process stippled; hy.-hypandrium (vertically lined). Fig. 24. Dististylus, lateral view, dorsal surface on left. Fig. 25. Lateral process, lateral view, dorsal surface on left. Fig. 26. Epandrium, dorsal view. Fig. 27. Aedeagus, lateral view, ventral surface above; s.p.-secondary process (stippled). Fig. 28. Sternite 8, ventral view. Fig. 29. Sternite 7, ventral view. Fig. 30. Tergite 8, dorsal view. Fig. 31. Tergite 7, dorsal view. Fig. 32. Genitalia, ventral view, sternite 8 vertically lined.



1.0 mm



terior spot bare of tomentum; laterotergite with about 20 long, slender bristles.

Legs: femora swollen, nearly twice as wide as tibiae. Bristles of femora, tibiae and tarsi long, rather strong. Pulvilli well developed.

Wings: marginal cell open; first posterior cell closed, usually petiolate; fourth posterior and anal cells closed and always petiolate. Costa complete, or greatly reduced in width (or absent) beyond apex of wing.

Abdomen (Figs. 38 to 41): pile short and appressed. Bristles numerous laterally on tergites 1 and 2; tergite 3, and sometimes tergites 4 and 5, with one or two lateral bristles; tergite 6 with visible portion one-half to two-thirds as long as tergite 5; tergite 7 broad, tergite 8 much reduced in middle third; sternite 7 present.

Genitalia, male (Figs. 33 to 37): hypandrium present, fused to basistyli of gonopods, bilobed, the lobes divergent to contiguous. Gonopods with a posteriorly directed median process which is bifurcate or entire; dististylus angulate in middle, the apex acute and recurved; lateral processes strongly clavate. Aedeagus with basal part reduced; tubes somewhat wide, coalesced distally; ejaculatory apodeme large. Epandrium longer than wide; ventral lamellae and cerci notched apically, not strongly sclerotized. Both gonopods and epandrium with numerous, strong, posterolateral bristles.

Genitalia, female (Fig. 42): apex of sternite 8 with lateral lobes large; median lobes feebly indicated by shallow emargination. Tergite 8 with 10 or more strong black bristles apically.

All species of *Zabrops* are sexually dimorphic. Besides the external differences in the genitalia of the two sexes, females have a wider face, longer wings, and wider abdomen—which generally is more extensively tomentose dorsally—than in the males. In addition, the hind tibiae are arcuate in males, straight in females.

TAXONOMIC HISTORY.—Hull (1957) described the genus *Zabrops*, with *Triclis tagax* Williston (1883) as the type-species. He stated that the

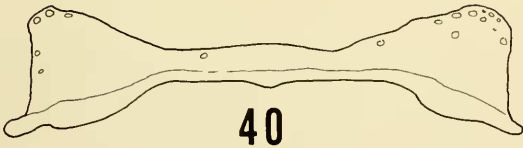
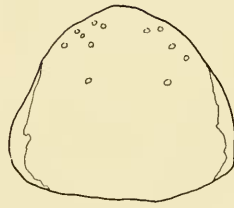
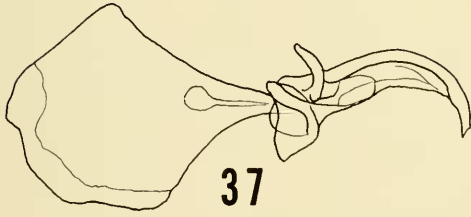
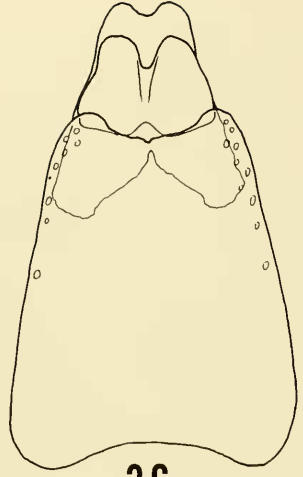
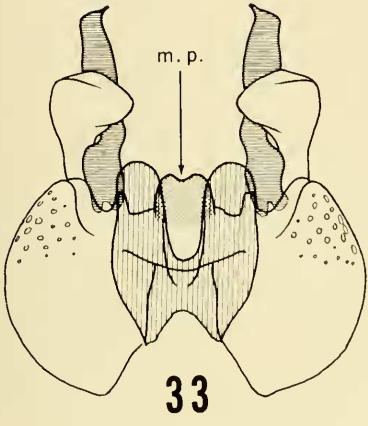
other American *Triclis* (*flavipilis* Jones [as "*flavipes*"]) and *argentifacies* Williston) probably belonged to *Zabrops* also. *Triclis tagax* was originally described from a female specimen collected in Kern County, California. Williston (1886) later presented a brief note on a male specimen of *tagax* from an unknown locality. A second species of *Triclis*, *argentifacies*, was described by Williston (1901) from material collected in Guerrero, Mexico.

Jones (1907) supplied the third North American species, *Triclis flavipilis*, based on a single female from Meadow, Nebraska. He indicated that his new species was close to *tagax* and that *Triclis* should possibly be synonymized with the genus *Laphystia*. Back (1909) studied an additional female specimen of *tagax* from California, commented on the possible synonymy of *Triclis* and *Laphystia*, and discussed several new characters for separating the two genera.

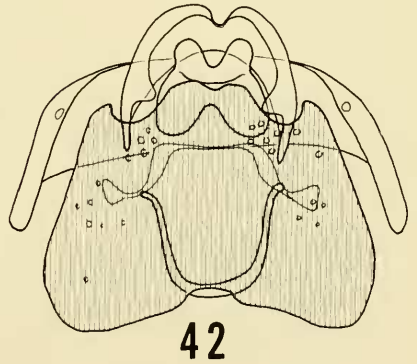
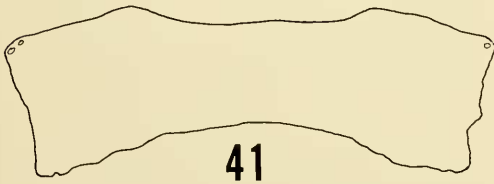
In a revision of the North American species of *Laphystia*, Wilcox (1960) presented a key to the regional genera of Laphystiini, used Hull's recently described genus *Zabrops* for the species of *Triclis* from the United States, and transferred the Mexican species *argentifacies* to the previously strictly Old World genus *Perasis* Hermann. Hull (1962) treated the world Asilidae, with descriptions and keys to the genera, including Laphystiini. Hull had not yet seen Wilcox's work and repeated his statement that both *flavipilis* (as "*flavipes*") and *argentifacies* probably belonged in *Zabrops*, although he formally listed them under *Triclis*. Martin and Wilcox (1965) listed *tagax* and *flavipilis* in *Zabrops* and *argentifacies* in *Perasis*.

SPECIES AND SUBSPECIES OF *ZABROPS*.—In the following key to the taxa of *Zabrops* it is necessary to determine the shape of the median process of the gonopods to properly identify males of the *tagax* species group. This can be done without dissection—see Figs. 46 and 47. The median process is more heavily sclerotized than the hypandrial lobes and appears black, in

FIGURES 33 TO 42. Terminal abdominal segments and genitalia of *Zabrops tagax tagax* (Figs. 33 to 41 males, Fig. 42 female). Fig. 33. Gonopods and hypandrium, ventral view, dististyli horizontally lined, median process stippled, hypandrium vertically lined; m.p.—median process. Fig. 34. Dististylus, lateral view, dorsal surface on left. Fig. 35. Lateral process, lateral view, dorsal surface on left. Fig. 36. Epandrium, dorsal view. Fig. 37. Aedeagus, lateral view, ventral surface above. Fig. 38. Sternite 8, ventral view. Fig. 39. Sternite 7, ventral view. Fig. 40. Tergite 8, dorsal view. Fig. 41. Tergite 7, dorsal view. Fig. 42. Genitalia, ventral view, sternite 8 lined.



1.0 mm



contrast to the reddish-brown color of the latter structures.

KEY TO SPECIES AND SUBSPECIES OF *ZABROPS*

- 1a. Front tomentose, with at most a small, shiny black spot above antennae; occipital bristles white to yellowish brown; males with hypandrial lobes well separated and rounded apically; southwestern United States and northwestern Mexico species ... 2
- 1b. Lower half of front shiny black; occipital bristles black; males with hypandrial lobes subcontiguous and apically emarginate; central United States species *flavipilis* (Jones)
- 2a. Costa complete; males with median process of gonopods entire or with apex notched; females with extensive shiny areas on abdominal tergites; (*tagax* group) 3
- 2b. Costa evanescent beyond apex of wing; males with median process of gonopods completely bifid; females with abdominal tergites all tomentose; (*thologaster* group) 12
- 3a. Males 4
- 3b. Females 8
- 4a. Gonopods with median process short, wider than long, the apex notched; southern California, southern Arizona, northwestern Mexico species; (*tagax* (Williston)) 5
- 4b. Gonopods with median process longer, twice as long as wide, the apex rounded or truncate; central and northern California species; (*wilcoxi* new species) 6
- 5a. Anterior margin of abdominal tergite 1 tomentose; erect hairs of mesonotum densest in dorsocentral rows, sparse elsewhere; marginal bristles of scutellum partly yellow; Mojave and Sonoran desert subspecies *tagax tagax* (Williston)
- 5b. Anterior margin of abdominal tergite 1 bare of tomentum; erect hairs of mesonotum dense, equally distributed over disc; marginal bristles of scutellum all black; coastal southern California and Baja California subspecies *tagax argutus* new subspecies
- 6a. Humeral area densely tomentose; mystax entirely white or yellow 7
- 6b. Humeral area bare of tomentum; upper third of mystax black, remainder white *wilcoxi playalis* new subspecies
- 7a. Apical abdominal tergites red; scutellum with marginal bristles all black .. *wilcoxi arroyalis* new subspecies
- 7b. Apical abdominal tergites black; scutellum with marginal bristles partly to entirely yellow *wilcoxi wilcoxi* new subspecies
- 8a. Abdominal tergites 2 to 4 with posterior tomentose fasciae interrupted by one-third their width or more; tergite 1 with broad posteromedian bare area 9
- 8b. Abdominal tergites 2 to 4 with posterior tomentose fasciae complete, or interrupted at middle by less than one-fourth their width; tergite 1 tomentose, with a small posteromedian bare spot *tagax tagax* (Williston)
- 9a. Apical abdominal tergites mostly or entirely black .. 10
- 9b. Apical abdominal tergites mostly red 11

- 10a. Mystax, erect mesonotal hairs and scutellar bristles all black *tagax argutus* new subspecies
- 10b. Mystax yellow; erect mesonotal hairs and scutellar bristles partly or entirely yellow *wilcoxi wilcoxi* new subspecies
- 11a. Humeral area bare of tomentum; abdominal tergites 2 to 4 with posterior fasciae interrupted by about two-thirds the width of abdomen *wilcoxi playalis* new subspecies
- 11b. Humeral area densely tomentose; abdominal tergites 2 to 4 with posterior fasciae interrupted by about one-third the width of abdomen *wilcoxi arroyalis* new subspecies
- 12a. Mesonotum thinly tomentose in center, with erect hairs distributed evenly over disc and subequal in length to antennal segments 1 and 2 together; lateral bristles of mesonotum mostly black; males with abdomen mostly tomentose, each tergite with dark grayish-brown tomentum anteriorly and light brownish-gray fasciae posteriorly .. *thologaster* new species
- 12b. Mesonotum bare of tomentum in center, with erect hairs mostly confined to dorsocentral rows and subequal in length to antennal segment 1; lateral bristles of mesonotum all white to brownish yellow; males with abdominal tergites mostly bare in center and tomentose posterolaterally *janiceae* new species

DESCRIPTIONS OF TAXA.—The genus *Zabrops* is readily divisible into three distinctive species groups which are probably equivalent to subgenera. However, to treat them as formal subgenera would serve little purpose in a genus with only five known species.

FLAVIPILIS SPECIES GROUP

This group, containing the single species—*flavipilis* (Jones)—is characterized by the following features.

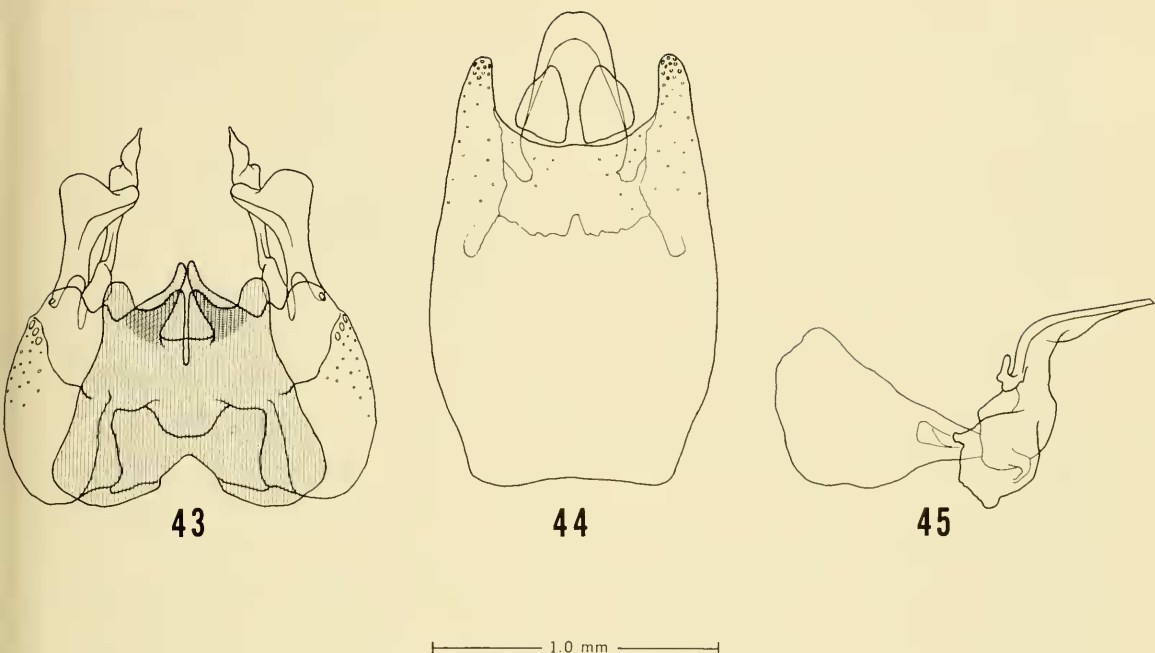
Head: face narrow, eye 1.5 to 1.7 times wider; lower 55 to 60 percent of face gibbous; antennae long, 90 percent height of eye, segment 3 narrow, three times as long as wide; style long, with two segments (the first very short).

Legs: hind tibiae with ventral surface thickly covered with soft pile of uniform height.

Wings: first posterior cell closed at margin; costa complete.

Abdomen: tergites 1 and 2 with lateral bristles (rather fine on tergite 2).

Male genitalia: hypandrium very large, three-fourths as wide as gonopods; hypandrial lobes wide, subcontiguous, and emarginate apically; gonopods with median process bifid, each half widely separated at base and converging or crossing apically; lateral processes with large posterolateral flange on club; posterolateral margins of epandrium produced into long points; aedeagus with tubes straight on distal half.



FIGURES 43 to 45. Male genitalia of *Zabrops flavipilis*. Fig. 43. Gonopods and hypandrium, ventral view, median process stippled, hypandrium lined. Fig. 44. Epandrium, dorsal view. Fig. 45. Aedeagus, lateral view, ventral surface above.

Zabrops flavipilis (Jones)

(FIGURES 43 to 45, 58, 74)

Triclis flavipilis Jones, 1907: 275. [Type locality: Meadow, Nebraska. Holotype: ?University of Nebraska (not examined).]

Triclis flavipilis. Back, 1909: 232; Hull, 1962: 86.

Zabrops flavipilis, Martin and Wilcox, 1965: 386.

DIAGNOSIS.—A shiny-black species with sparse golden-yellow pile and tomentum. The wide hypandrium, with the lobes apically emarginate, and the shape of the gonopods are diagnostic.

MALE.—Head black; face densely golden tomentose, frons, vertex, and occiput more thinly so, lower half of frons with transverse shiny band; mystax black on upper third, remainder golden-yellow; hairs golden-yellow on plane portion of face, ocellar tubercule, vertex, and occiput; bristly hairs on sides of frons and slender, somewhat proclinate, occipital bristles black; beard and hairs on proboscis and palpi yellowish white. Antennal segment 1 ventrally with many long black bristles and a few yellow hairs, dorsally with a few short yellow hairs; apex of segment 2 with a few short black hairs; length ratio of segments 1.5:1.0:2.5:0.5.

Thorax black, humeri and postalar calli brownish; dorsum shiny, golden-yellow tomentum present on thin lateral margin of pronotum and mesonotum and on two small spots above scutellum; pleura with tomentum yellowish-gray; lateral mesonotal bristles black, remainder of thoracic pile and bristles golden-yellow; pile short, sparse, and recumbent anteriorly on mesonotum, longer posteriorly and on pleura; two to three short anterior dorsocentrals. Scutellum with a few short hairs on disc and 12 long, slender, marginal bristles. Legs black, pile golden-yellow, bristles mostly same but with some black on tibiae and tarsi; ventral surface of pro- and mesotibiae with scattered pile and long bristles, of metatibiae with dense brush of short pile. Wings subhyaline, anterior margin and apical one-third slightly infuscate; veins dark brown.

Abdomen (Fig. 58): black, thin apical margins of tergites 4 to 6 brownish; sides of tergite 1 and posterolateral corners of tergites 2 to 5 with golden-yellow tomentose spots, these spots becoming shorter and wider posteriorly; sternites mostly shiny, each with posterior margin yellow-gray tomentose; pile golden-yellow, short and very sparse dorsally, longer laterally and

ventrally. Genitalia: as in Figs. 43 to 45; basistyli and epandrium with bristles black.

FEMALE.—No specimens examined. Judging from the original description, the female differs in having the mystax mostly black, with some yellow bristles near the oral margin. In addition, probably the face and abdomen are wider and the tomentose markings are more extensive on the abdominal tergites; these differences occur in the females of the other species of *Zabrops*.

SPECIMENS EXAMINED (Two males) KANSAS, *Riley County*: 13 July (Popenoe, EF). OHIO, *Scioto County*: Friendship, 16 July 1961 (P. H. Freytag, OSU).

DISCUSSION.—I have not examined the female holotype but Jones's (1907) excellent description leaves no doubt as to the identity of this distinctive species.

Other than differences in size, there is only slight variation between the two males studied. The Ohio specimen has more deeply emarginate hypandrial lobes than shown in Fig. 43 (Kansas male) and the median processes of the gonopods cross apically. The Kansas specimen has red humeri and postalar calli, and the two tomentose spots above the scutellum are much larger.

Measurements (in mm; values without parentheses of Kansas specimen, those with parentheses of Ohio specimen): eye width 1.00 (0.88); face width 0.60 (0.56); body length 10.1 (9.2); wing length 5.8 (6.0); tergite 3 width 2.1 (1.9). Ratios: eye width/face width 1.67 (1.57); body length/wing length 1.75 (1.53).

Zabrops flavipilis is by far the most widely distributed species in the genus, the three known specimens indicating a range of at least 1400 km across the central United States (Fig. 74). In fact, the spotty distribution of this species, with its known range far removed from other *Zabrops*, seems to indicate that it is a relict species. It also appears to be the most primitive species in the genus, as shown by these characteristics: the long, two-segmented antennal style; the complete costa; the large, wide hypandrium, which is scarcely reduced or emarginate.

TAGAX SPECIES GROUP

A group consisting of two polytypic species—*tagax* (Williston) and *wilcoxi* new species—and characterized as follows.

Head: eye about 1.1 to 1.4 times wider than face; lower 65 to 70 percent of face gibbose; antennae shorter, about two-thirds height of eye, segment 3 wider, 2.5 times longer than wide; style short, with only one segment.

Legs: ventral surface of hind tibiae thickly covered with soft pile of uniform height.

Wings: first posterior cell closed and usually short petiolate; costa complete.

Abdomen: tergites 1 and 2 or 1 to 3 with strong lateral bristles.

Male genitalia: hypandrium small, less than half as wide as gonopods; hypandrial lobes narrow, about 1.8 to 2.8 times longer than wide, widely separated and rounded apically; gonopods with median process entire or with apex notched; lateral processes with club small, without flange; epandrial margin not produced; aedeagus with tubes curved on distal half.

Zabrops tagax (Williston)

A partly shiny-black species with somewhat dense, short, mostly recumbent, varicolored pile and white to yellow tomentum. Males have gonopods with a median process that is wider than long—about half as long as the lobes of the hypandrium—and with a deep apical notch; each hypandrial lobe is about 1.8 times longer than wide.

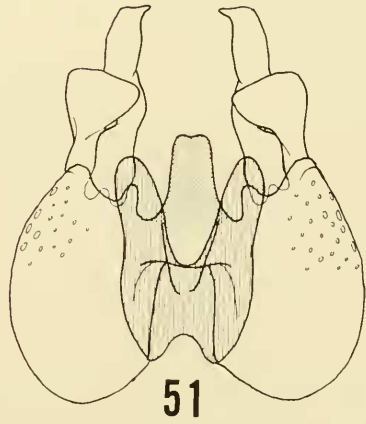
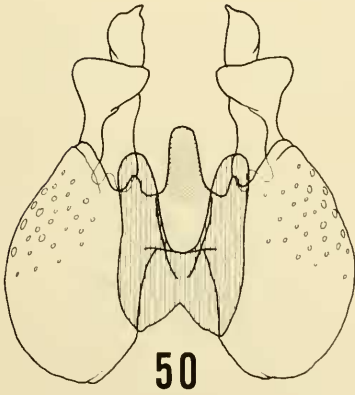
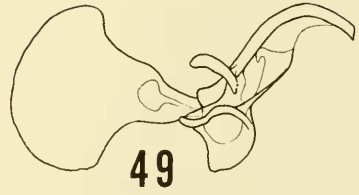
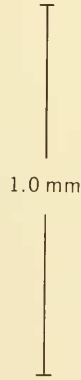
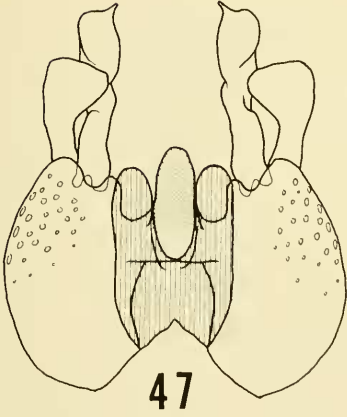
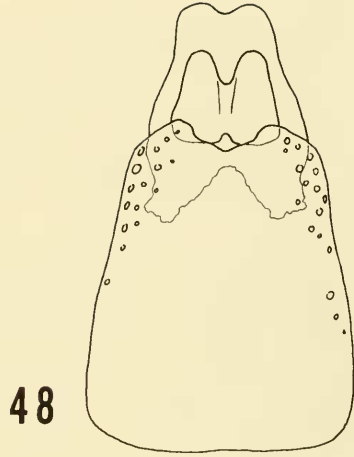
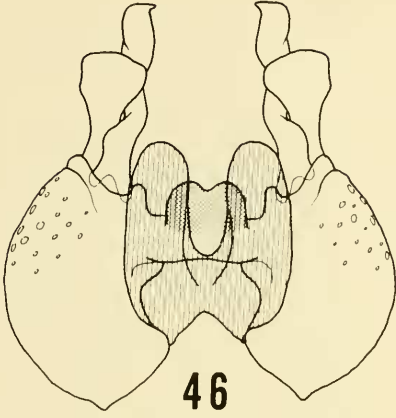
This species comprises two subspecies: *Z. t. tagax* is a Mojave and Sonoran desert form; *Z. t. argutus*, new subspecies, is cismontane, occurring along the western edge of the Peninsular and Transverse ranges in northern Baja California and southern California (Fig. 73).

Zabrops tagax tagax (Williston), new status

(FIGURES 33 to 42, 59, 66, 73)

Trichis tagax Williston, 1883: 9, pl. 1, figs. 6 (wing) and 6a (head). [Type locality: Kern County, California. Holotype: UK.]

FIGURES 46 to 51. Male genitalia of *Zabrops* spp., tagax group. Fig. 46. Gonopods and hypandrium of *Zabrops tagax argutus*, ventral view, median process stippled, hypandrium lined. Fig. 47. Gonopods and hypandrium of *Zabrops wilcoxi wilcoxi*, ventral view, median process stippled, hypandrium lined. Fig. 48. Epandrium of *Zabrops wilcoxi wilcoxi*, dorsal view. Fig. 49. Aedeagus of *Zabrops wilcoxi wilcoxi*, lateral view, ventral surface above. Fig. 50. Gonopods and hypandrium of *Zabrops wilcoxi playalis*, ventral view, median process stippled, hypandrium lined. Fig. 51. Gonopods and hypandrium of *Zabrops wilcoxi arroyalis*, ventral view, median process stippled, hypandrium lined.



Triclis tagax, Williston, 1886: 37; Back, 1909: 231, pl. 9, fig. 3 (whole insect).

Zabrops tagax, Hull, 1957: 90; Wilcox, 1960: 329; Hull, 1962: 99, figs. 58 (antenna), 444 (wing), 883, 892 (head); Martin and Wilcox, 1965: 386.

DIAGNOSIS.—The nominate subspecies is characterized by having generally lighter-colored pile, the erect mesonotal hairs sparser, and the tomentum more extensive dorsally on the abdomen. The females have whitish tomentose bands across the apex of each abdominal tergite; these bands are greatly narrowed or, usually, interrupted in the center.

FEMALE.—Description based on holotype (specimen teneral). Length 7.9 mm. Head dark brown; tomentum whitish, densest along orbits, thinnest on vertex, occiput, and antennal segment 1; all hairs and bristles yellowish white, except on bristle on ocellar tubercule black and beard and hairs of proboscis and palpi white; eye 1.2 times wider than face. Antennal segment 1 and 2 equal in length; segment 3 missing.

Thorax black; vestiture yellowish white, lateral bristles and some posterior dorsocentrals black. Mesonotum with broad median stripe and adjacent lateral intermediate stripes shining; remaining area tomentose—anterolateral corners (wider and longer than humeri), broad lateral margins, and most of posterior declivity; pile fairly dense, short and recumbent; erect bristly hairs mostly in dorsocentral rows, anteriorly subequal in length to antennal segment 1. Scutellum with anterior corners tomentose, abundant discal pile, and 14 long marginal bristles. Legs dark brown, hairs and bristles mostly yellowish white, some tarsal and metatibial bristles black. Wings: length 5.4 mm; hyaline, veins yellow-brown; first posterior cell closed at margin on one wing, narrowly petiolate on other. Halteres yellow-brown, slightly darker at base.

Abdomen (Fig. 66): 2.0 mm wide; segments 1 to 3 black, 4 to 7 dark brown, all with narrow posterior margins yellowish brown; vestiture yellowish white. Tergite 1 tomentose, with a small, subtriangular, posteromedian bare spot; tergites 2 to 4 with lateral and posterior margins tomentose, tomentum in form of fasciae, very short medially and increasing in length laterally, anterior corners and broad anteromedian semicircular area bare; tergites 5 and 6 similar but fasciae interrupted medially; venter evenly and thinly tomentose; pile short and recumbent dorsally, longer laterally on tergites 1 and 2, and ventrally.

MALE.—Description based on specimen from Yermo, San Bernardino County, California, differing from holotype in following manner. Head with pile whiter; length ratio of antennal segments 1.2:1.0:2.2:0.4.

Thorax with some anterior erect bristly hairs black; about half of scutellar bristles black. Wings with veins dark brown; first posterior cells closed, short petiolate.

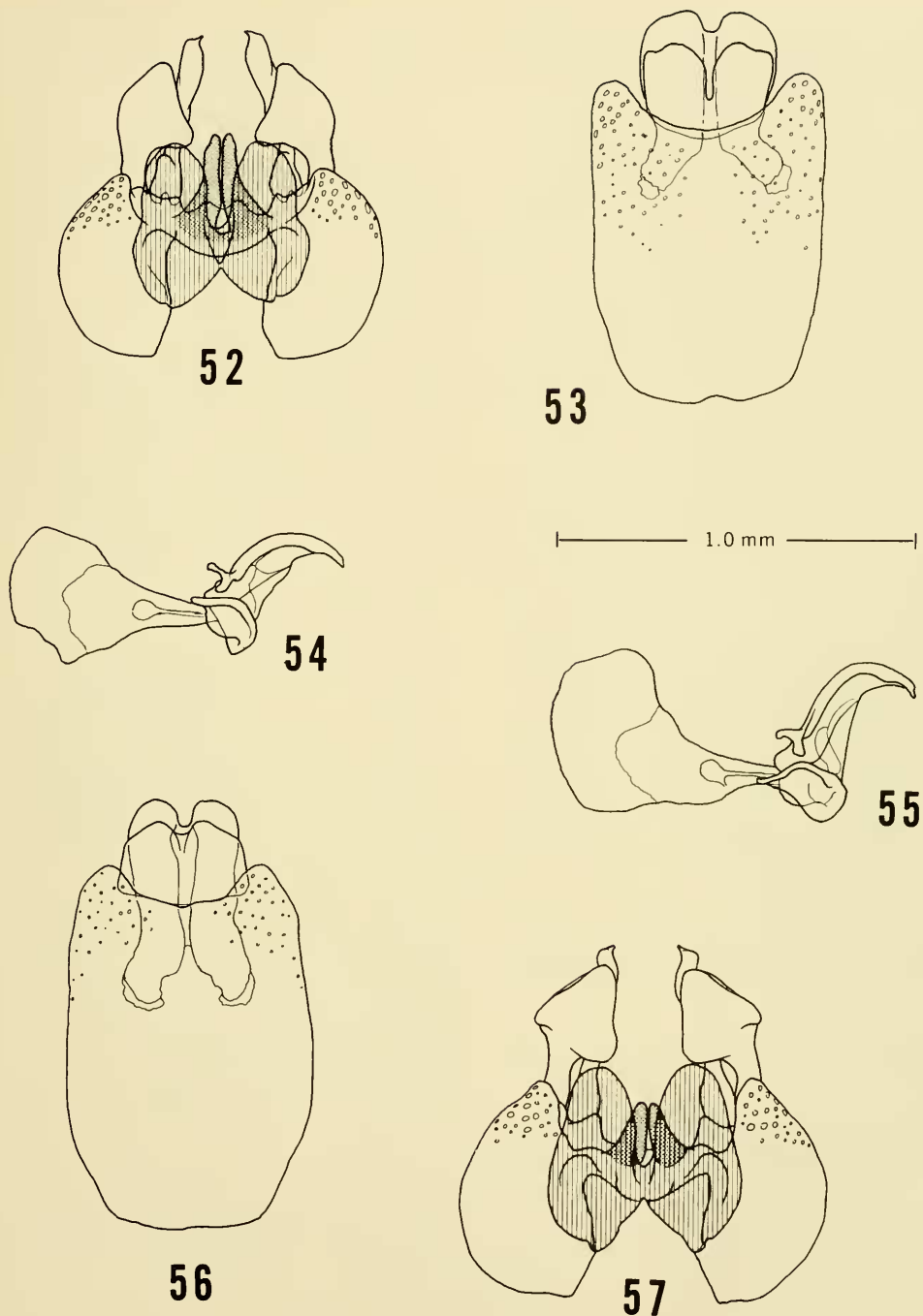
Abdomen (Fig. 59): tergite 1 tomentose on lateral edges and narrowly along anterior margin; tergites 2 to 6 with tomentum confined to spots on posterolateral corners, these spots becoming shorter and wider posteriorly, except on tergite 6, where they are very small; on tergite 3, spots separated by at least half the width of abdomen. Genitalia (Figs. 33 to 37): median process of gonopods only slightly wider than long.

SPECIMENS EXAMINED (212 males, 178 females).—Holotype: female, Kern County, California.

Other specimens. **USA.**—**CALIFORNIA.** *San Bernardino County:* Yermo; Barstow; Adelanto; Goffs; (25 Mar. to 25 Apr.). *Los Angeles County:* Piute Butte, (12 May). *Riverside County:* 10 miles (16 km) E of Whitewater; Indio; 5 miles (8 km) W of Indio; Thousand Palms; Palm Springs; (26 Feb. to 29 Apr.). *San Diego County:* Borrego Valley; Coyote Creek, 4.5 miles (7.2 km) N of Borrego Springs; Borrego Springs; Tub Canyon; Ocotillo; (7 Mar. to 9 Apr.). *Imperial County:* Truck-haven; (5 Apr.).—**ARIZONA.** *Yuma County:* Ehrenberg; 10 miles (16 km) W of Aguila; Wellton; (6–15 Apr.). *Pinal County:* 1.5 miles (2.4 km) N of Florence; Florence; 5 miles (8 km) S of Florence; Florence Junction; (9 Apr. to 2 May). *Maricopa County:* Tempe; 8 miles (13 km) S of Buckeye; Palo Verde; Sentinel; 18 miles (29 km) S of Gila Bend; (7–22 Apr.). *Pima County:* Marana; 23 miles (37 km) N of Ajo; 10 miles (16 km) N of Ajo; Organ Pipe Cactus National Monument; (16 Mar. to 12 Apr.). **MEXICO.**—**SONORA:** 27 miles (43 km) SE of San Luis; 25 miles (40 km) NW of Sonoita; between Sonoita and Punta Peñasco, 500 feet (152 m); (2–30 Mar.).

DISCUSSION.—The holotype represents a population that apparently has not been rediscovered. The only locality information accompanying the type is “Kern Co Clf.” No additional specimens of *Z. t. tagax* have been collected in Kern County. Also, in the holotype the tomentose abdominal fasciae is entire, and the mystax, anterior mesonotal pile and scutellar bristles are all yellowish white. Several female specimens collected in the Mojave Desert (at Yermo and Adelanto) approach this phenotype; however, they have narrowly interrupted abdominal fasciae. All other populations of this subspecies studied have some of the above mentioned hairs or bristles partly black.

Variation in populations of *Z. t. tagax* is as



FIGURES 52 to 57. Male genitalia of *Zabrops* spp., thologaster group. Fig. 52. Gonopods and hypandrium of *Zabrops thologaster*, ventral view, median process stippled, hypandrium lined. Fig. 53. Epandrium of *Zabrops thologaster*, dorsal view. Fig. 54. Aedeagus of *Zabrops thologaster*, lateral view, ventral surface above. Fig. 55. Aedeagus of *Zabrops janiceae*, lateral view, ventral surface above. Fig. 56. Epandrium of *Zabrops janiceae*, dorsal view. Fig. 57. Gonopods and hypandrium of *Zabrops janiceae*, ventral view, median process stippled, hypandrium lined.

follows: CALIFORNIA: *San Bernardino County*: males with scutellar bristles sometimes all black; posterolateral spots frequently smaller, separated by three-fourths the width of abdomen on tergite 3. Females with mystax all white to half white, half black; scutellum with many to all bristles yellow; fasciae on abdominal tergites 2 to 4 usually interrupted by about one-fourth the width of abdomen. *Riverside County, San Diego County*: males with scutellar bristles sometimes all black; posterolateral spots on tergites 2 to 5 more approximate medially, separated by about one-third the width of abdomen. Females generally with mystax mostly, and scutellar bristles entirely, black; abdominal fasciae entire or slightly interrupted. ARIZONA: males with scutellar bristles frequently all black; abdominal spots usually separated by half the width of abdomen on tergite 3. Females with mystax one-third to one-half black; abdominal fasciae interrupted by one-fourth the width of abdomen; occasionally (two specimens from Pinal County) anterior portion of tergites 2 to 4 thinly tomentose, with middle one-fourth bare. SONORA: males with many to all scutellar bristles yellow; abdominal spots separated on tergite 3 by two-thirds to three-fourths the width of abdomen. Females with mystax all white; scutellar bristles all or nearly all yellow; tergite 1 with posteromedian bare area twice as broad as in holotype, and tergites 2 to 5 with fasciae separated by one-third the width of abdomen.

The female specimens from Sonora are similar to females of the new subspecies described below, at least in respect to the tomentose patterns of the abdomen.

Zabrops tagax argutus Fisher, new subspecies

(FIGURES 46, 60, 67, 73)

DIAGNOSIS.—Distinguished from *Z. t. tagax* by the darker pile, the denser erect hairs of the mesonotum, and the reduced tomentum on the abdominal tergites of the females.

HOLOTYPE MALE.—Length 10.4 mm. Differs

from *Z. t. tagax* in the following respects. Light colored vestiture of body generally with more yellow caste; erect bristly hairs of mesonotum black, dense, equally distributed over disc, anteriorly subequal in length to antennal segments 1 and 2 together. Scutellum with marginal bristles black. Abdomen (Fig. 60) with sides only of tergite 1 tomentose; tergites 1 to 6 with some black pile centrally. Genitalia as in Figure 46; median process almost twice as wide as long.

ALLOTYPE FEMALE.—Length 9.7 mm. Similar to male. Head with these hairs and bristles black; mystax (except for a few hairs laterally and on oral margin yellow); several strong bristles on antennal segments 1 and 2; most of hairs on side of frons; bristles on ocellar tubercule. Abdomen (Fig. 67) with tergite 1 tomentose laterally and anteriorly, leaving a large triangular bare area; tergites 2 to 6 with tomentum broadly interrupted, at tergite 3 by about one-third the width of abdomen.

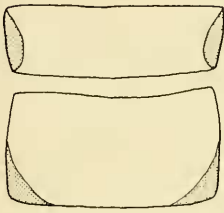
TYPE SPECIMENS.—Holotype (CAS): male, 7 miles (11 km) NW of El Rosario, Baja California, Mexico, 28 Mar. 1970 (E. M. and J. L. Fisher, EF). Allotype female (CAS), same data as for holotype.

Paratypes (32 males, 13 females). MEXICO.—BAJA CALIFORNIA: 9 males, 2 females, same data as for holotype; 10 miles (16 km) NW of El Rosario, 1 male, same date and collector as for holotype; near Consuelo, 6 miles (9.7 km) NW of El Rosario, 2 males, 3 females, 18 Apr. 1965 (D. Q. Cavagnaro, C. F. and E. S. Ross, and V. L. Vesterby, CAS); 1 mile (1.6 km) E of El Rosario, 1 male, 9 Apr. 1969 (S. C. Williams, CAS); 18.3 km E of El Rosario, 1 male, 9 Apr. 1973 (E. L. Sleeper, CSLB); La Bocana Beach, 7 km W of El Rosario, 1 female, 12 Apr. 1973 (E. L. Sleeper, CSLB). USA.—CALIFORNIA, *Riverside County*: Lake Mathews, 1 male, 16 Apr. 1953 (A. L. Melander, USNM); 8 miles (12.9 km) E of Sunnymead, 2 males, 12 Apr. 1958 (E. I. Schlinger, UCD, CM); Riverside, 3 males, 3 females, 12 May 1949 (A. L. Melander, USNM). *Los Angeles County*: Azusa, 1 male, 1 female, 24 May 1925 (collector unknown), 4 males, 2 females, 9 May 1941 (J. Wilcox, JW); Beverly Glen Canyon, Santa Monica Mountains, 7 males, 4 May 1962 (E. M. Fisher, EF); Topanga Canyon, 1 male, 10 June 1952 (R. Laxineta, LACM).

DISCUSSION.—Variation is slight in this subspecies. Some of the males from the type locality have black hairs laterally on the frons and dorsally on antennal segments 1 and 2. In males from

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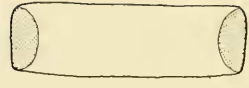
FIGURES 58 to 72. Abdominal tergites 1 (upper) and 3 (lower) of *Zabrops* spp., dorsal view, tomentose areas stippled (Figs. 58 to 65 males, Figs. 66 to 72 females). Fig. 58. *Zabrops flavipilis*. Fig. 59. *Zabrops tagax tagax*. Fig. 60. *Zabrops tagax argutus*. Fig. 61. *Zabrops wilcoxi wilcoxi*. Fig. 62. *Zabrops wilcoxi playalis*. Fig. 63. *Zabrops wilcoxi arroyalis*. Fig. 64. *Zabrops thologaster*. Fig. 65. *Zabrops janiceae*. Fig. 66. *Zabrops tagax tagax*. Fig. 67. *Zabrops tagax argutus*. Fig. 68. *Zabrops wilcoxi wilcoxi*. Fig. 69. *Zabrops wilcoxi playalis*. Fig. 70. *Zabrops wilcoxi arroyalis*. Fig. 71. *Zabrops thologaster*. Fig. 72. *Zabrops janiceae*.



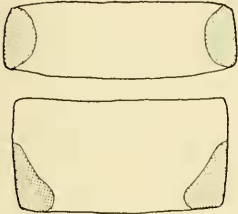
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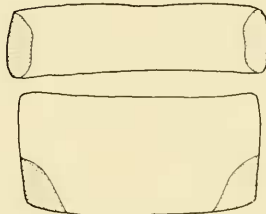
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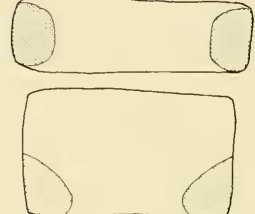
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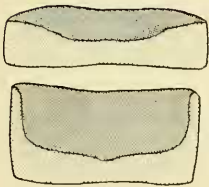


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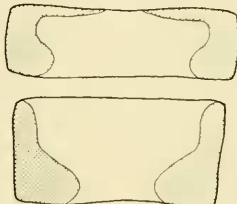


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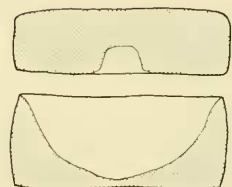
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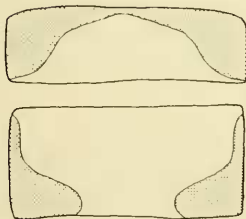
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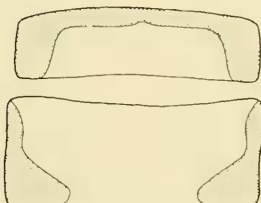
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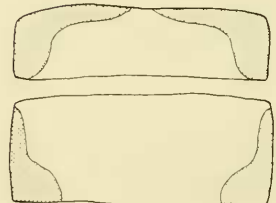
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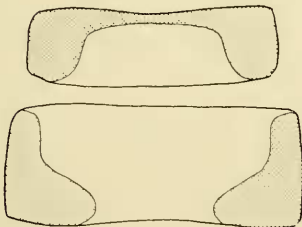
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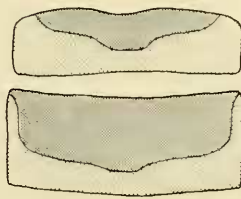
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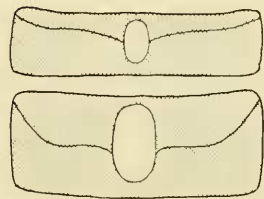
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Los Angeles and Riverside counties the apical abdominal tergites tend to be reddish posteriorly, and some of the vestiture is more brownish yellow, especially the tomentum of the mesonotum. Females from these counties have antennae and frons all yellow haired, and in one specimen from Riverside the apical half of the abdomen is broadly red.

The subspecific name is derived from Latin and means "shiny" or "clear"—in reference to the more shiny aspect of the abdominal tergites.

The specimens from 7 miles (11 km) northwest of El Rosario were found resting on very sandy soil between large shrubs in the bottom of a canyon. Those from Beverly Glen Canyon were taken resting on the clay soil of a road cut.

Zabrops wilcoxi Fisher, new species

A species closely related to *Z. tagax*, and generally quite similar in appearance, differing mainly in the form of the male genitalia. In males the median process of the gonopods is more elongate, twice as long as wide, subequal in length to the lobes of the hypandrium, and the apex is rounded or truncate; the hypandrial lobes are narrower, approximately 2.6 to 2.8 times longer than wide.

None of the females have an abdomen as extensively tomentose as in *Z. t. tagax*; however, their patterns of tomentum are very similar to those in *Z. t. argutus*.

Zabrops wilcoxi comprises three subspecies.

Zabrops wilcoxi wilcoxi Fisher, new species

(FIGURES 47 to 49, 61, 68, 73)

DIAGNOSIS.—Distinguished from related subspecies by both sexes having entirely yellow mystax and predominantly black apical abdominal tergites; in males the median process of the gonopods is rounded apically and the hypandrial lobes are parallel.

HOLOTYPE MALE.—Length 10.0 mm. Integument black, narrow apices of abdominal tergites 4 and 5, and most of 6, brown. Head with pile and tomentum whitish yellow; mystax dense, with about 60 bristles.

Thorax with tomentum brownish yellow; recumbent and lateral pile whitish yellow; erect bristly hairs mostly black, fairly dense and evenly distributed over mesonotum, anteriorly a little longer than antennal segment 1. Scutellar bristles mostly black. Legs with pile mostly yellow; metatibiae with one-third of pile and two-thirds

of bristles black; bristles of hind tarsi mostly black.

Abdomen (Fig. 61) with sides of tergite 1 and posterolateral corners of tergites 2 to 5 whitish tomentose; tergite 6 bare of tomentum. Dorsal pile recumbent, fairly dense, about two-thirds as long as antennal segment 1; small central area on each tergite black pilose, remainder yellowish-white pilose. Genitalia as in Figs. 47 through 49; apex of median process rounded; hypandrial lobes parallel. Strong bristles black.

ALLOTYPE FEMALE.—Length 9.2 mm. Differs from male as follows: integument brown on posterior half of tergite 6; thorax with anterior erect bristly hairs mostly yellow, shorter, rather sparse; abdomen (Fig. 68) with tomentose fasciae interrupted on tergite 3 by about half the width.

TYPE SPECIMENS.—Holotype (CAS): male, Mount Diablo, Contra Costa County, California, 2 June 1940 (M. Cazier, CAS). Allotype female (CAS), same data as for holotype.

Paratypes (98 males, 56 females), all from California. *Contra Costa County*: 10 males, 7 females, same data as for holotype; Mount Diablo, 1 male, 21 May 1937 (E. S. Ross, CAS), 1 male, 29 Apr. 1917 (E. P. Van Duzee, CAS), 1 male, 17 May 1958 (J. A. Chemsak, CIS); Marsh Canyon, E. of Mount Diablo, 1 female, 20 Apr. 1947 (C. W. Anderson, CIS); near Murietta Caves, Mount Diablo, 8 males, 3 females, 2 June 1940 (B. Brookman, CAS); 3 miles (4.8 km) S of Byron, 1 male, 5 Apr. 1964 (R. W. Thorpe, CIS); Danville, 4 males, 3 females, 27 Apr. 1949, 4 males, 3 females, 22 May/5 June 1952 (F. X. Williams, CAS); 2 miles (3.2 km) SW of Martinez, 1 male, 1 female, 7 May 1959 (T. R. Haig, CDA). *Glenn County*: Fruto, 2 males, 6 June 1954 (M. Wasbauer, CIS). *Mendocino County*: 10 miles (16 km) E of Capella, 1 female, 5 May 1960 (T. R. Haig, CDA). *Lake County*: Clear Lake Oaks, 1 male, 10 May 1959 (C. H. Laton, UCD). *Napa County*: Samuel Springs, 1 male, 9 May 1955 (R. M. Bohart, UCD), 2 males, 2 females, 22 May 1956 (E. I. Schlinger, UCD), 2 males, 2 females, 30 May 1955 (R. C. Bechtel, A. A. Grigarick, UCD, CM). *Yolo County*: Davis, 1 male, 10 May 1960 (F. D. Parker, UCD), 1 male, 11 May 1954 (E. I. Schlinger, CM), 1 male, 20 May 1952 (H. F. Robinson, UCD). *Sacramento County*: North Sacramento, 1 male, 19 May 1955 (P. D. Hurd, CIS). *Solano County*: Vallejo, 1 male, 27 May 1950 (J. N. Simons, CIS). *Alameda County*: Berkeley, 1 female, May 1940 (J. Hansen, CAS). *San Joaquin County*: Tracy, 1 male, 15 May 1933 (A. Michelbacher, CIS). *Stanislaus County*: 3 miles (4.8 km) NW of La Grange, 1 male, 6 Apr. 1966 (S. M. Fullerton, EF). *San Mateo County*: Redwood City, 2 males, 2 females, 2 June 1951, 8 males, 30 May 1954 (P. H. Arnaud, Jr., CAS, JW). *Santa Clara County*: Stanford University, 1 male, 3 May 1956, 2 males, 2 females ("resting on ground, grassy hillside"), 6 May 1954, 4 males, 1 female, 18 May 1951 (P. H. Arnaud, Jr., CAS, JW), 2 males, 1 female, 7/14 May 1910 (W. M. Mann, USNM), 7 males, 5 females, 19/20 May 1920, 9 males, 5 females, June 1920 (F. R. Cole, CIS, JW); Palo Alto, 3 males, 1 female, 19 May 1940 (E. S. Ross, CAS); Alum Rock Park, 1 male, 25 May 1950 (J. W. MacSwain, CIS); San Jose, 1 female, 18 May 1965 (R. P. Allen, CIS). *Merced County*: Panoche Hills, 3 males, 3 females, 30 Apr. 1922 (E. C. Van Dyke, CAS). *San Benito County*: Panoche Creek, 3 males,

3 females, 30 Apr. 1922 (A. J. Basinger, CAS). *Monterey County*: Salinas, 5 males, 5 females, 25 May 1952 (P. H. Arnaud, Jr., JW); Bryson, 1 male, 1 female, 19 May 1920 (E. P. Van Duzee, CAS). *Fresno County*: Mercy Hot Springs, 1 male, 12 May 1954 (O. Bryant, CAS). *Tulare County*: Porterville, 1 male, 2 Apr. 1960 (E. Ball, FSCA). *San Luis Obispo County*: Pozo, 1 female, 1 May 1962 (P. D. Hurd, CIS).

DISCUSSION.—*Zabrops w. wilcoxi* is found in the vicinity of San Francisco and San Pablo bays and at low elevations in the Coast Ranges to the north and south. Two collections of this subspecies are known from the northern part of the San Joaquin Valley and two specimens have been collected on the east side of the valley, near La Grange and at Porterville (Fig. 73).

Several female specimens from the type locality have all yellow scutellar and hind tibial bristles. In specimens of both sexes from Napa and Glenn counties, especially males, the apical one or two abdominal tergites are mostly reddish brown. In specimens from San Mateo and Santa Clara counties southward the anterior mesonotal hairs, the scutellar bristles, and the metatibial pile and bristles are all, or nearly all, yellow.

It is a great pleasure to name this species in honor of Mr. Joseph Wilcox, who has contributed so much to the knowledge of North American Asilidae.

Zabrops wilcoxi playalis Fisher, new subspecies

(FIGURES 50, 62, 69, 73)

DIAGNOSIS.—The absence of tomentum on the lateral portions of the humeri in both sexes and males with the upper one-third of the mystax black are characters which serve to separate this subspecies from others in the *tagax* group.

HOLOTYPE MALE.—Length 9.4 mm. Integument black, except tarsi brown and posterior one-third of tergite 4, half of 5, and all of 6 red. Head: tomentum grayish white; upper one-third of mystax, most of hairs on front and bristles on ocellar tubercle black; occipital bristles yellow; beard white; other pile yellowish white.

Thorax with tomentum gray dorsally and yellow laterally; lateral portion of humeri and area posterior to humeri bare of tomentum, shiny black; recumbent and lateral pile yellow; erect bristly hairs dense, black, subequal in length to antennal segment I. Scutellar bristles black. Legs: posterior pair with bristles and short pile black on apical part of femora and most of tibiae; posterior tarsi with pile and bristles black, an-

terior and middle tarsi with some bristles black; remaining vestiture whitish yellow.

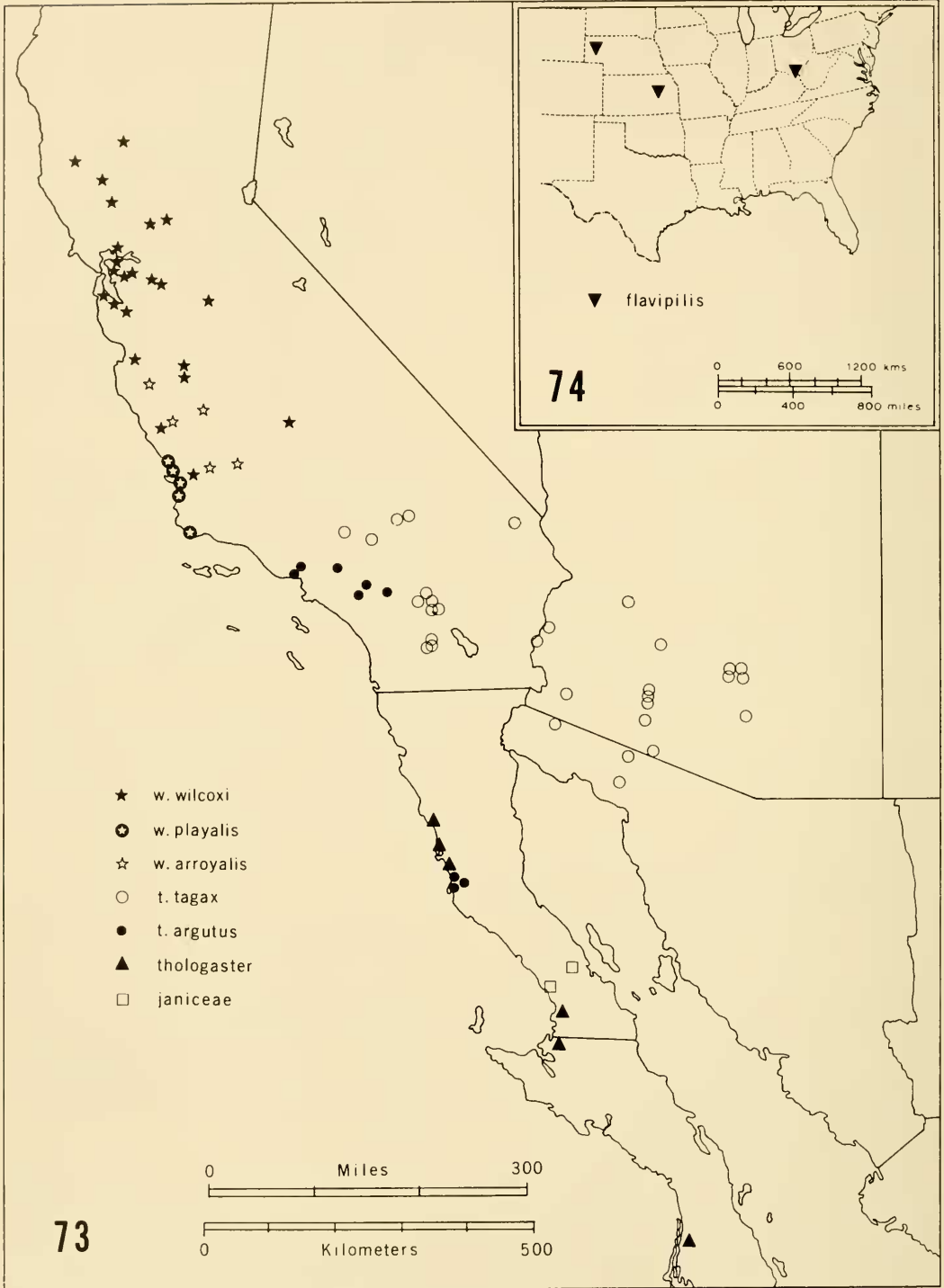
Abdomen (Fig. 62): tomentum white; dorsal recumbent pile about as long as antennal segment I, black medially, yellowish on anterior and lateral margins; longer pile and bristles on tergites 1 and 2 whitish. Genitalia as in Fig. 50; median process tapered and somewhat truncate apically; hypandrial lobes slightly divergent; numerous strong bristles of gonopods and epandrium black.

ALLOTYPE FEMALE.—Length 9.3 mm. Similar to male but differing as follows: face and front with whitish-yellow vestiture, mystax nearly all black; hind legs with short pile mostly yellow; abdomen with tomentum more extensive, as in Fig. 69; fasciae on tergite 3 separated by half width of abdomen.

TYPE SPECIMENS.—Holotype (CAS): male, Oceano, San Luis Obispo County, California, 23 June 1970 (J. Wilcox, JW). Allotype female (CAS), same data as for holotype.

Paratypes (138 males, 91 females), all from California. *San Luis Obispo County*: 7 males, 3 females, same data as for holotype; type locality, 5 males, 1 female, 9 July 1969, 4 males, 4 females, 14/16 July 1970 (J. Wilcox, JW), 2 males, 5 females, 24 Apr. 1951 (R. M. Bohart, UCD); Morro Dunes, 3 males, 7 females, 17 June 1947 (A. L. Melander, USNM); 1 mile (1.6 km) N of Morro Bay, 1 male, 1 female, 23 June 1970 (J. Wilcox, JW); Morro Bay, 1 male, 30 Apr. 1962 (J. Powell, CIS); 4 males, 2 females, 26 June 1963, 3 males, 4 females, 4 July 1963 (J. C. Hall, UCR); Baywood Park, 1 male, 23 June 1970, 3 males, 8 July 1969, 1 male, 1 female, 15 July 1970, 2 males, 20 Sept. 1968 (J. Wilcox, JW); Los Osos, 1 female, 26 May 1970, 1 male, 21 Sept. 1968 (J. Wilcox, JW); Pismo Beach, 29 males, 5 females, 13 May 1956 (J. Wilcox, JW), 10 males, 7 females, 29 June 1959 (P. H. Arnaud, Jr., CIS, CDA), 9 males, 4 females, 7/9 July 1969 (J. Wilcox, JW), 1 male, 1 female, 13 July 1965 (C. A. Toschi, M. J. Tauber, CIS), 1 female, 15 July 1967 (M. E. Irwin, UCR), 1 female, 26 July (J. Wilcox, JW); Grover City ("dunes association"), 35 males, 20 females, 4 July 1956, 3 males, 3 females, 14 Aug. 1957 (P. D. Hurd, E. G. Linsley, CIS); Oso Flaco Lake, 5 miles (8 km) S of Oceano, 4 males, 27 Apr. 1968 (J. Chemsak, J. Powell, CIS), 3 males, 5 females, 11 May 1965 (R. Langston, J. Powell, CIS), 2 males, 29 June 1967 (M. E. Irwin, UCR), 1 male, 2 females, 13 July 1959 (R. M. Bohart, F. D. Parker, CM), 2 females, 14 July 1965 (M. R. Gardner, J. Powell, CIS, UCD); Dunes Lake, 7 miles (11.3 km) S of Oceano, 4 males, 6 females, 4/5 June 1971 (J. D. Pinto, UCR). *Santa Barbara County*: Point Conception, 1 male, 1 female, 20 June 1951 (K. W. Tucker, UCD).

DISCUSSION.—*Zabrops w. playalis* inhabits the coastal sand dunes of Morro and San Luis Obispo bays. It also has been collected at Point Conception, so presumably it will be found in other suitable areas of the central California coast (Fig. 73). Its subspecific name is derived from the word "playa," which is "shore" or "beach" in Spanish.



FIGURES 73 and 74. Fig. 73. Distribution of *Zabrops wilcoxi*, *tagax*, *thologaster* and *janiceae* in the southwestern United States and northwestern Mexico. Fig. 74. Distribution of *Zabrops flavipilis* in the central United States.

Specimens of this subspecies present a very uniform habitus, differing noticeably only in the body size and the amount of red at the apex of the abdomen. This character varies from the apical three segments all red to only tergite 6 red; males tend to have more red than do females.

One male specimen (Pismo Beach, 24 June 1959) had a small bombyliid as prey.

Zabrops wilcoxi arroyalis Fisher, new subspecies

(FIGURES 51, 63, 70, 73)

DIAGNOSIS.—This taxon can be identified by the following combination of characters: both sexes with apical two or three abdominal tergites red and mesonotum with lateral margin of tomentum complete; males with mystax all white and median process of gonopods truncate apically; females with mystax mostly black and fasciae on tergite 3 separated by one-third width of abdomen.

HOLOTYPE MALE.—Length 10.0 mm. Integument black, dorsum of abdominal tergite 4, and all of 5 and 6 red. Head with vestiture white, occipital bristles yellow, those of ocellar tubercle black.

Thorax with dorsal tomentum and recumbent pile yellowish white; lateral vestiture white; erect bristly hairs black, not dense but distributed evenly over disc, short, anteriorly about two-thirds as long as antennal segment 1; scutellum with marginal bristles all black. Legs with pile white, bristles of hind legs nearly all black, remaining bristles white.

Abdomen (Fig. 63) with tomentum white, posterolateral spots a little wider than in *Z. w. wilcoxi*, separated by about one-half width of abdomen on tergite 3, recumbent dorsal pile about one-half as long as antennal segment 1, nearly all black; longer lateral and ventral pile white. Genitalia as in Fig. 51; median process short, very slightly notched at apex; hypandrial lobes a little more divergent than in *Z. w. playalis*.

ALLOTYPE FEMALE.—Length 10.8 mm. Head: mystax with about two-thirds of bristles black, remainder yellowish white; less dense than in other subspecies, consisting of around 40 bristles. Vestiture of front, vertex and occiput yellowish white; remainder as in male.

Thorax with recumbent pile denser and erect bristly hairs sparser than in male.

Abdomen (Fig. 70) with tomentum more extensive than in other subspecies of *wilcoxi*; fas-

ciae on tergite 3 interrupted by one-third width of abdomen; dorsal recumbent pile very short, mostly yellowish white; lateral pile reduced, consisting mostly of bristles on tergites 1 and 2.

TYPE SPECIMENS.—Holotype (CIS): male, 10 miles (16 km) W of Simmler, San Luis Obispo County, California, 5 May 1962 (R. W. Thorp, CIS). Allotype (CIS): female, same data as for holotype.

Paratypes (25 males, 18 females), all from California. *San Luis Obispo County*: 16 males, 13 females, same data as for holotype. *Fresno County*: Coalinga, 9 males, 4 females, 1 May 1941 (J. Wilcox, JW). *Kern County*: 18 miles (29 km) N of McKittrick, 1 female, 1 May 1941 (J. Wilcox, JW).

OTHER SPECIMENS (2 females).—CALIFORNIA, *Monterey County*: 1 mile (1.6 km) S of Soledad, 1 female, 11 Apr. 1961 (R. W. Thorp, CIS); Pleyto, 1 female, 22 May 1920 (E. P. Van Duzee, CAS).

DISCUSSION.—This subspecies occurs along the southwestern edge of the San Joaquin Valley and in the foothills of the adjacent Coast Ranges. In the western and northern parts of its range, it overlaps with the nominate subspecies *Z. w. wilcoxi*, although neither taxa have been collected at the same locality (Fig. 73).

Variation is as follows. Several males and females from the type locality and one male from Coalinga have some black hairs on the front, antennae, and anterior part of the humeri. In a few of these, some or all of the occipital bristles are also black; these bristles are white to yellowish brown in all other species of *Zabrops*, save for *flavipilis*. In females from the type locality, tergites 4 and 5 may be partly blackish dorsally.

The two female specimens from Monterey County agree in most respects with the type material; however, they differ in having a denser mystax (about 60 bristles) and yellowish tomentum of the face and front, as in the nominate subspecies. For these reasons they have not been included as paratypes.

This subspecies is named for the habitat—arroyos—in which nearly all of the specimens have been collected.

Two specimens of *Zabrops wilcoxi* (1 male, 1 female), from an uncertain locality, are probable intergrades between the subspecies *wilcoxi* and *playalis*. These specimens have the mystax and abdominal tergite coloration characteristic of *playalis*, but the mesonotal tomentum and the color of the hind tibial pile are as in *wilcoxi*. The male genitalia are also intermediate in structure, the median process tapering but the hypandrium lobes parallel.

The locality data for the two intergrades are: California, Santa Barbara County, 6 miles (9.7 km) south of Pine Mountain Summit, 13 June 1962 (L. H. Dawson, UCR). There is a Big Pine Mountain and a Little Pine Mountain, both in the San Rafael Mountains (about 32 and 22 air km north, respectively, of Santa Barbara), but no "Pine Mountain Summit." However, there is such a locality in Ventura County, about 5 km east of the Santa Barbara county line. If this is the actual site referred to on the label, 6 miles (9.7 km) south (along state highway 33) would be at about 1200 m in the Sespe River gorge. If these flies are from one of the San Rafael Mountain sites, the elevation would be about the same. Whichever locality is correct, this collection represents the southeastern-most record for *Zabrops wilcoxi*, as well as the highest altitude that a specimen of the genus has been taken.

THOLOGASTER SPECIES GROUP

Two new species, known only from Lower California, form this group—*Z. thologaster* and *Z. janiceae*. The group can be differentiated by the features below.

Head: as in the *tagax* group; antennae with segment 3 more robust, two times longer than wide.

Legs: hind tibiae without soft pile.

Wings: first posterior cell closed and short petiolate; costa evanescent beyond apex of wing, either greatly reduced in width, or entirely absent; anterior branch of third vein (R_1) sometimes with basal stump vein or, in rare cases, a complete crossvein forming third submarginal cell.

Abdomen: generally tergites 1 to 4 or 1 to 5 with strong lateral bristles.

Male genitalia: hypandrium moderate sized, a little over half as wide as gonopods; hypandrial lobes about 1.5 times longer than wide, well separated and rounded apically; gonopods with median process bifid, the halves subcontiguous; lateral processes with club large, without flange; epandrium with posterolateral margins rounded, slightly produced; aedeagus with tubes curved on distal half.

Zabrops thologaster Fisher, new species

(FIGURES 52 to 54, 64, 71, 73)

DIAGNOSIS.—A species with extensive brown and gray tomentum dorsally in both sexes, the mesonotum covered with long bristly hairs, and

the males with the median process of the gonopods as long as the hypandrial lobes.

HOLOTYPE MALE.—Length 7.9 mm. Integument black, tarsi, trochanters, and narrow apices of tergites 3 to 5, and most of 6, brownish. Head: vestiture grayish white, except occipital bristles yellowish brown, about 20 bristles in upper third of mystax and two bristles of ocellar tubercle black. Antennae with segment 1 a little longer than segment 2, together subequal to segment 3.

Thorax: lateral margin of mesonotum and pleura gray tomentose; broad median stripe and shorter lateral intermediate stripes thinly brown tomentose; these stripes separated by narrow, longitudinal, grayish-brown tomentose lines which connect to a large patch of golden-brown tomentum on posterior declivity. Recumbent dorsal pile brownish yellow, rather sparse, especially in middle; pleural pile grayish white. Erect bristly hairs black, sparsely but evenly distributed over disc, anteriorly as long as antennal segments 1 and 2 together, posteriorly as long as antennae. Scutellum with golden-brown tomentose spots on lateral margins, and similar colored discal pile; about 20 marginal bristles, about 5 black, 15 yellowish brown. Legs: hind tibiae and tarsi with pile and bristles about half black, rest of legs with vestiture yellowish white. Wings: 5.3 mm long, very lightly and evenly infuscated.

Abdomen (Fig. 64): 1.7 mm wide. Tergites 1 to 5 with posterior margin and most of lateral margins gray tomentose, remainder of dorsum with thin grayish-brown tomentum; anterolateral corners of tergites 2 to 5 bare; tergite 6 mostly bare, apical corners grayish tomentose. Short recumbent pile dense, colored to match tomentose patterns; longer pile on sides of tergites 1 to 3 and on venter white. Genitalia: as in Figs. 52 to 54; bristles and hairs mixed black and white.

ALLOTYPE FEMALE.—Length 8.2 mm. Very similar to male. Mystax about three-fourths black; mesonotum with median and lateral stripes mostly obscured by denser tomentum; recumbent pile denser, especially in middle; erect bristly hairs slightly shorter; scutellum with tomentose spots larger and marginal bristles all yellowish brown; legs with bristles nearly all yellowish white; abdomen 2.1 mm wide, with tergite 6 tomentose as on tergites 1 to 5.

TYPE SPECIMENS.—Holotype (CAS): male, 0.5 miles (0.8 km) NE of El Molino, Bahía San Quintín, Baja California, Mexico, 29 Mar. 1970 (E. M. and J. L. Fisher, EF). Allotype female (CAS), same data as for holotype.

Paratypes (80 males, 32 females), all from Mexico. BAJA CALIFORNIA: 57 males, 8 females, same data as for holotype; 3 miles (4.8 km) NW of Camalú, 23 males, 19 females, 29 Mar. 1970 (E. M. and J. L. Fisher, EF); El Socorro Sand Dunes, 5 males, 12 Apr. 1973 (E. L. Sleeper, CSLB).

OTHER SPECIMENS (all from Mexico).—BAJA CALIFORNIA: 21 miles (34 km) SSE of El Rosarito (long. 114°W), 1 male, 9 Oct. 1972 (E. M. Fisher, EF).—BAJA CALIFORNIA SUR: Guerrero Negro, 3 males, 18 Mar. 1967 (D. S. Verity, EF); 15 miles (24 km) S of San [Santo] Domingo, 1 male, 4 Oct. 1941 (R. M. Bohart, E. S. Ross, CAS).

DISCUSSION.—*Zabrops thologaster* occurs along the Pacific coast of Lower California where it has been found on very sandy soil just inland from the shore line (Fig. 73). Many specimens were taken sitting next to, or even underneath, low-growing plants.

The species is the only *Zabrops* in which males have an abdomen as extensively tomentose as that of females. Its name is derived from the Greek ("tholos," dirt or dirt-colored; and "gaster," belly) and refers to the gray-brown color of the abdomen.

Considerable variation is present in this species. In specimens from the type locality, the mystax ranges from one-fourth to one-half black in males, and one-half to three-fourths black in females; scutellar bristles range from half black to all yellow in both sexes. Females from 3 miles (4.8 km) north of Camalú exhibit similar variation but may have both mystax and scutellar bristles mostly black. The five males from El Socorro Sand Dunes have all white mystax and all yellow scutellar bristles.

Specimens from 21 miles (34 km) SSE of El Rosarito, Guerrero Negro, and 15 miles (24 km) south of San Domingo (all males) have all white mystax and all yellow scutellar bristles and these variations as well: mesonotum with tomentum thinner, partly shiny on median stripe, lateral stripe, and posterior declivity; abdominal tergites 1 to 5 with a posteromedian bare spot (narrowly interrupting the fasciae) and tergites 2 to 5 with anterior margins narrowly bare; integument reddish brown on ventral side of all femora and basal half of all tibiae. In the specimen from 15 miles (24 km) south of San Domingo, the integument of abdominal segments 2 to 5 are also broadly reddish apically.

Several male and female specimens from Bahía San Quintín and Camalú have a small stump vein present at the base of the anterior branch of the third vein (R_1). One female (Camalú) has a com-

plete crossvein forming a third submarginal cell, in addition to a stump vein.

The material from the southern half of the range of *Z. thologaster* is different enough phenotypically to indicate that subspecific distinction might be warranted. However, it would be premature to do this now as only a few individuals (and no females) have been collected in this area, and the full range of variation is not known. Also the male genitalia of specimens from Guerrero Negro are the same as in the type series.

Two individuals collected from Bahía San Quintín had small flies as prey: a male with a ceratopogonid and a female with a tachinid.

Zabrops janiceae Fisher, new species

(FIGURES 55 to 57, 65, 72, 73)

DIAGNOSIS.—Very similar to *Zabrops thologaster*, but distinguished from that species as follows: (1) mesonotum in both sexes bare of tomentum dorsally, with erect hairs shorter and sparser, and with lateral bristles all white to brownish yellow; (2) males with abdominal tergites extensively bare of tomentum and with median process of gonopods half as long as hypandrial lobes; (3) females with abdominal tergites light- and dark-gray tomentose.

HOLOTYPE MALE.—Length 9.7 mm. Integument black; these portions red: apical one fourth of abdominal tergites 2 to 5 and most of 6, trochanters, tibiae, and tarsi. Head: face and front yellowish-gray tomentose; vertex and occiput gray tomentose. Mystax and beard white; antennae and frontal hairs yellowish white; bristles of ocellar tubercule and occiput yellow.

Thorax: gray tomentose, broad median dorsal stripe, confluent lateral-intermediate stripes, and narrow, median posterior stripe shining black. Pile white laterally, yellowish white dorsally, with some black median and posterior dorsocentral hairs; short, recumbent pile very dense, partially obscuring black integument, absent in very narrow anteromedian, longitudinal stripe; anterior erect bristly hairs short—as long as antennal segment I—and very sparse. Scutellum with posterolateral corners white tomentose; discal pile and marginal bristles yellowish white. Legs: pile and bristles white. Wings: length 7.4 mm; membrane hyaline; base of R_1 with small stump vein.

Abdomen (Fig. 65): width 1.9 mm. Lateral and

narrow anterior margins of tergite 1, and lateral edges and posterolateral corners of tergites 2 to 5, thinly gray tomentose; tergites 1 to 6 densely covered with short, recumbent, yellow pile which partially obscures ground color; lateral pile and bristles yellowish white. Genitalia: as in Figs. 55 to 57; bristles mostly white.

ALLOTYPE FEMALE.—Length 9.2 mm. Very similar to male holotype with these differences: disc of scutellum with central bare spot, remainder gray tomentose; abdomen (Fig. 72) entirely gray tomentose above, except anterolateral corners of tergites 2 to 5 and dorsomedian oval spots on tergites 1 to 6 bare. Anterodorsal portion of all tergites yellowish gray, remainder whitish gray. The shade and intensity of tomentum color changes with angle of view; when viewed from above and without magnification, tomentum appears dark gray anteriorly and light gray posteriorly.

TYPE SPECIMENS.—Holotype (CAS): male, 20 miles (32.2 km) W of Bahía de Los Angeles, Baja California, 22 Mar. 1970 (E. M. and J. L. Fisher, EF). Allotype female (CAS), same data as for holotype.

Paratypes (10 males, 19 females), all from Mexico. BAJA CALIFORNIA: 8 males, 18 females, same data as for holotype; Arroyo Santo Dominguito, 1.5 miles (2.4 km) S of Santa Rosalilita, 2 males, 1 female, 25 Mar. 1970 (E. M. and J. L. Fisher, EF).

DISCUSSION.—This species is known from only two localities in central Baja California, one on the Pacific coast and the other near the Gulf coast, east of the Peninsular Divide (Fig. 73).

Specimens from both these localities are very similar, and the total variation in the material at hand is small. Individuals of both sexes have these variations: apical half of hind tibiae darker and with brown to black bristles; wing venation anomalies similar to those in *Z. thologaster*; lateral bristles of mesonotum yellowish brown; one to three extra notopleural bristles anteriorly. In females the bare spot on the scutellum sometimes extends to the posterior margin of the disc.

The specimens from 20 miles (32.2 km) west of Bahía de Los Angeles were taken on sandy soil about ice plant, *Mesembryanthemum crystallinum* Linnaeus; those from Arroyo Santo Dominguito were found atop a large sand dune which bordered a large sandy wash, about one kilometer from the coast.

Zabrops janiceae is named in honor of my wife, Janice Lee Fisher, who collected part of the type material and has collected many other interesting robber flies as well.

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